JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

CONVENTION ISSUE · JUNE · 1960

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JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

CONVENTION ISSUE

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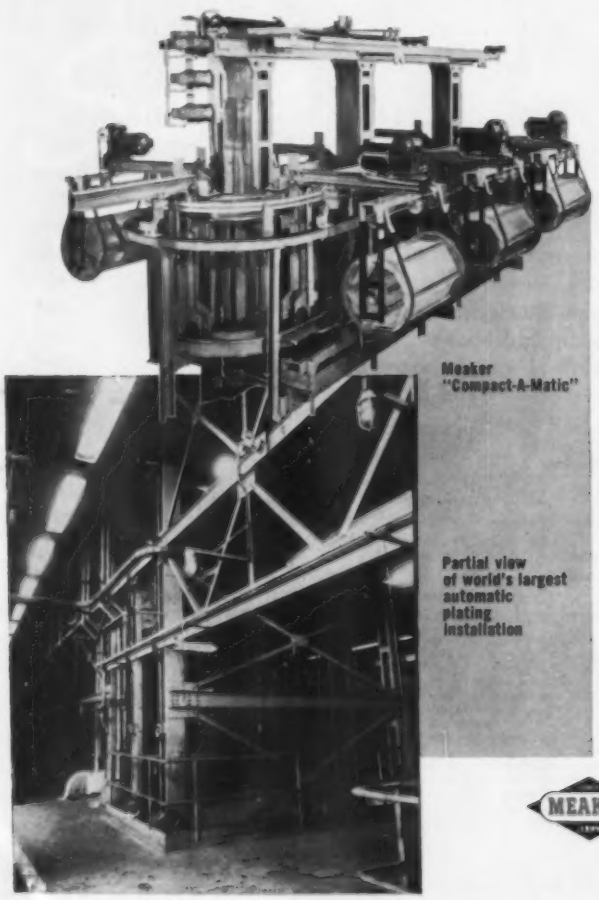

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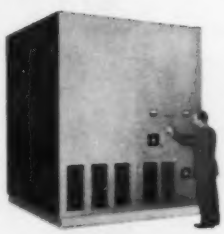

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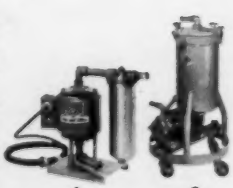

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EDITORIAL

AES's FIRST FAMILY TREK TO AMERICA'S FAR WEST

IN A HALF-CENTURY'S lifetime, American Electroplaters' Society, Inc. (AES) has never deviated even a millimeter from its target of enriching technical and scientific knowledge thereby fostering advancements in electroplating, metal finishing and allied arts. Educational assembly at both national and Branch levels is among the tools for imparting knowledge that AES has employed to that purpose through the years with progressive development in breadth and technique. The national annual convention is an educational medium that, in fact, has played an inordinately important role in AES's educational progress through five decades.

AES's first full-scale annual convention was held in New York City in June 1913. Since that far off day, AES has visited the following 24 municipalities the following number of times with annual conventions through 1959, its FIFTIETH ANNIVERSARY:

Detroit	5	Rochester	2	Pittsburgh	2	Providence	1
Cleveland	4	Cincinnati	2	Newark	1	Toledo	1
New York	3	Montreal	2	Atlantic City	1	Toronto	1
Chicago	3	Washington	2	Indianapolis	1	Bridgeport	1
Philadelphia	3	Boston	2	Asbury Park	1	Grand Rapids	1
Milwaukee	3	Buffalo	2	St. Louis	1		
Dayton	2					Total	47

During that long span, its Pittsburgh Branch is the only one of 58 chartered AES Branches that has hosted an AES Annual Convention in two successive years. The Society has journeyed outside of the United States three times, visiting Montreal, Canada, twice and Toronto, Canada, once. Of its 47 conventions held from 1913 through 1959, some 22 were conducted in communities east of Pittsburgh, including Canada—25 were held in Pittsburgh or in cities west thereof. Convention site farthest west to 1960 has been St. Louis. The entire AES family is looking forward, however, to the Society's first Annual Convention west of the Mississippi River that will be held in Los Angeles, California, July 24–28, 1960, with its Los Angeles Branch, its Pacific Coast trailblazer, as host Branch.

On the heels of AES's mammoth five-day GOLDEN JUBILEE Convention and Industrial Finishing Exposition, including its concurrent Fifth International Conference on Electrodeposition and Metal Finishing, held in Detroit in June 1959 that broke all AES records for stature of international attendance and of international educational and institutional impact, its 1960 Los Angeles Convention will expectedly be another memorable assembly from many standpoints.

Against the vacationland background and the industrial, scenic and other abundance of America's "Wonder City", AES's Los Angeles Branch has both fashioned an educational program of stellar magnitude, and balanced it with entertainment and relaxational fare heralded as being second to none in the Society's long convention history. In attending and partaking, may you and yours not only be educationally enriched but may you also create priceless memories to last you a full lifetime.

John P. Nichols

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IN BACKTRACKING through the last half-century, then retracing steps appraisingly along the pathway of American Electroplaters' Society's (AES) history, there is constant view of the concurrent progress of the "plater and metal finisher" and the "plating and metal finishing supplier." These latter not only educationally displayed up-to-date equipment and supplies at AES exhibitions and expositions through the years, particularly as products of their experimentation and development achieved reality, but they also cooperated in AES Annual Conventions by providing a good measure of educational, relaxational and fellowship fare.

Individually interested in the AES's educational goal and mission, most of the leadership and management and much of the rank and file of these electroplating and metal finishing companies are individual members of today's AES, and many of these companies themselves, as AES Sustaining Members, are participating in the Society's vital research program being conducted in American and Canadian universities and foundations.

Many of these progressive industrial companies started advertising in PLATING MAGAZINE back in the Nineteen Thirties when PLATING was MONTHLY REVIEW. On merit, most of these, plus many others enroute, have advertised in PLATING consistently ever since.

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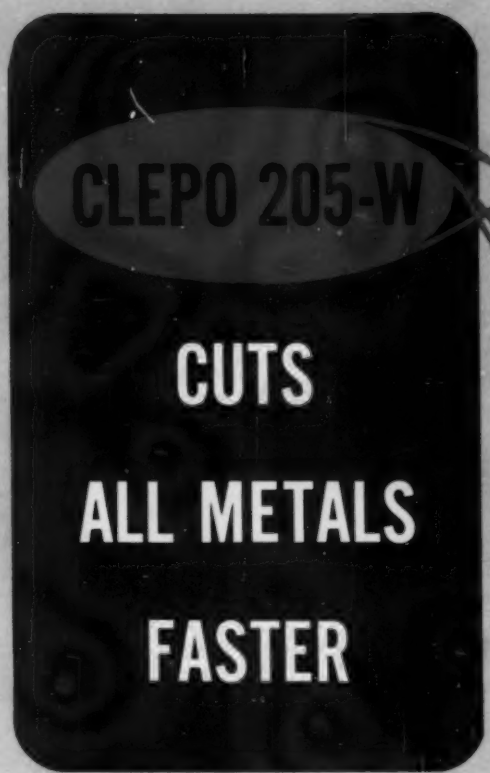

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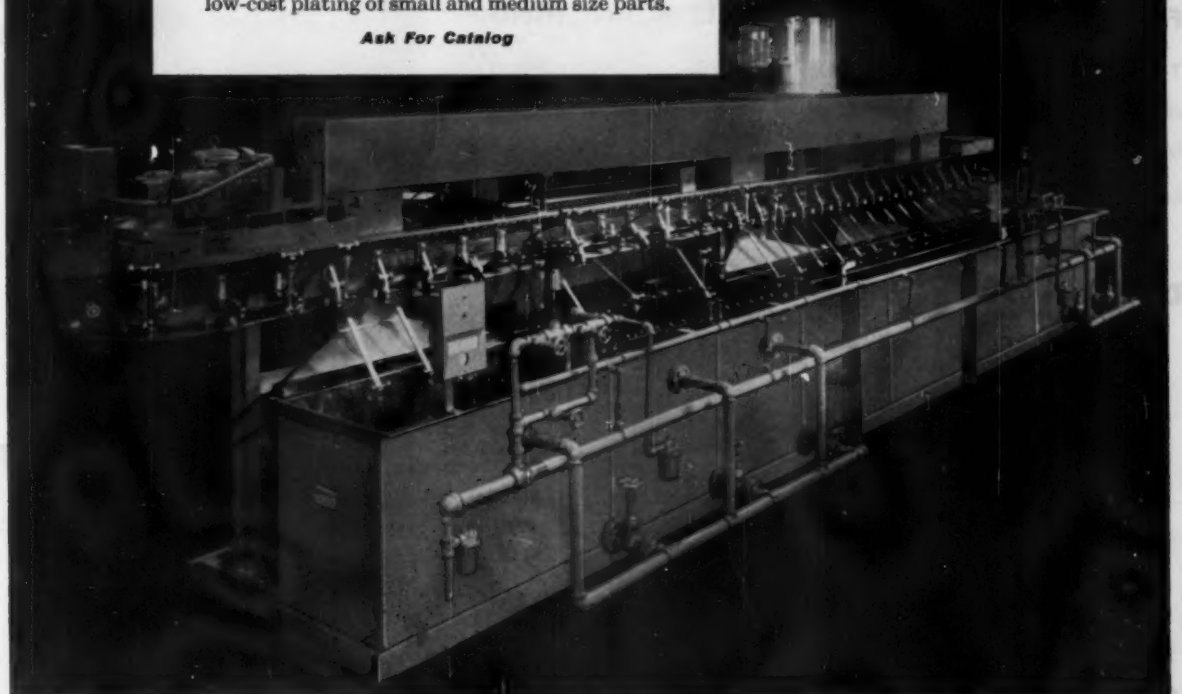

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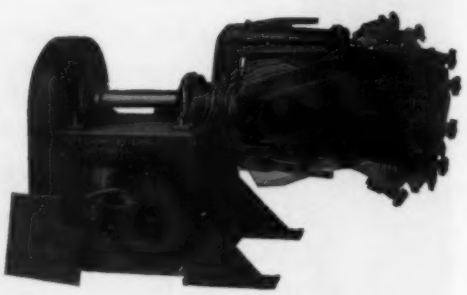

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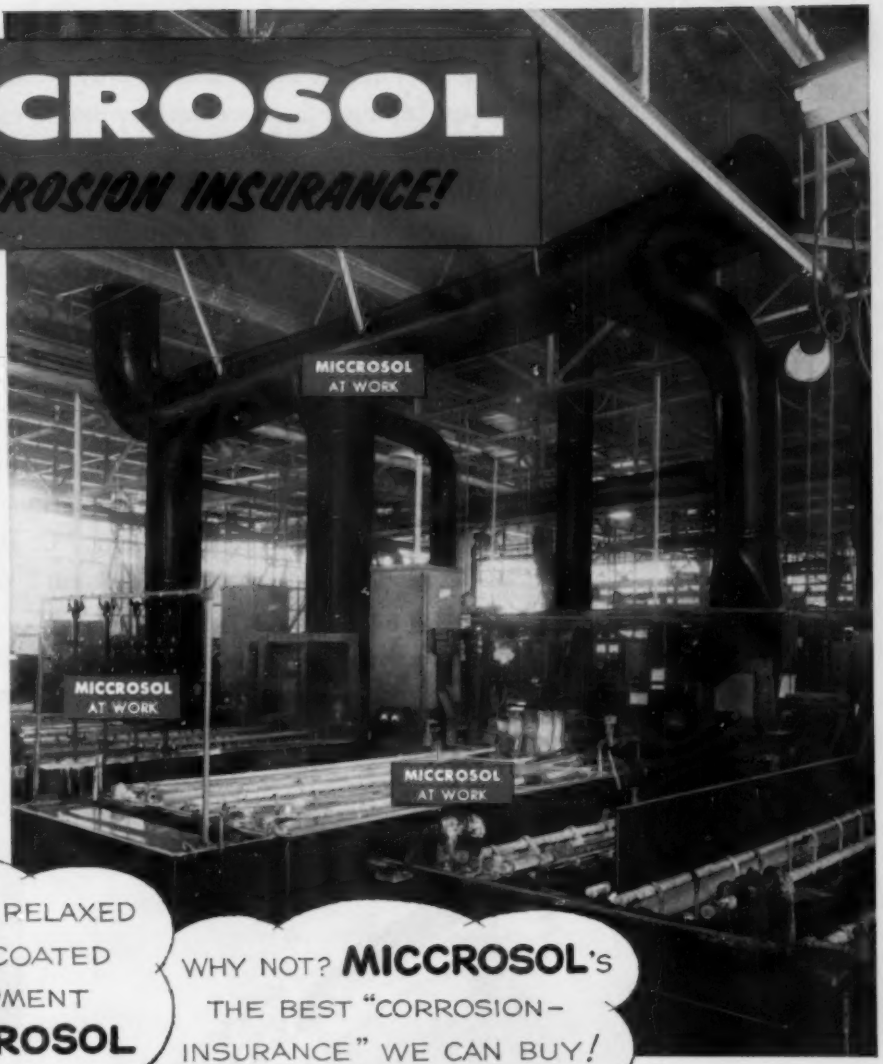

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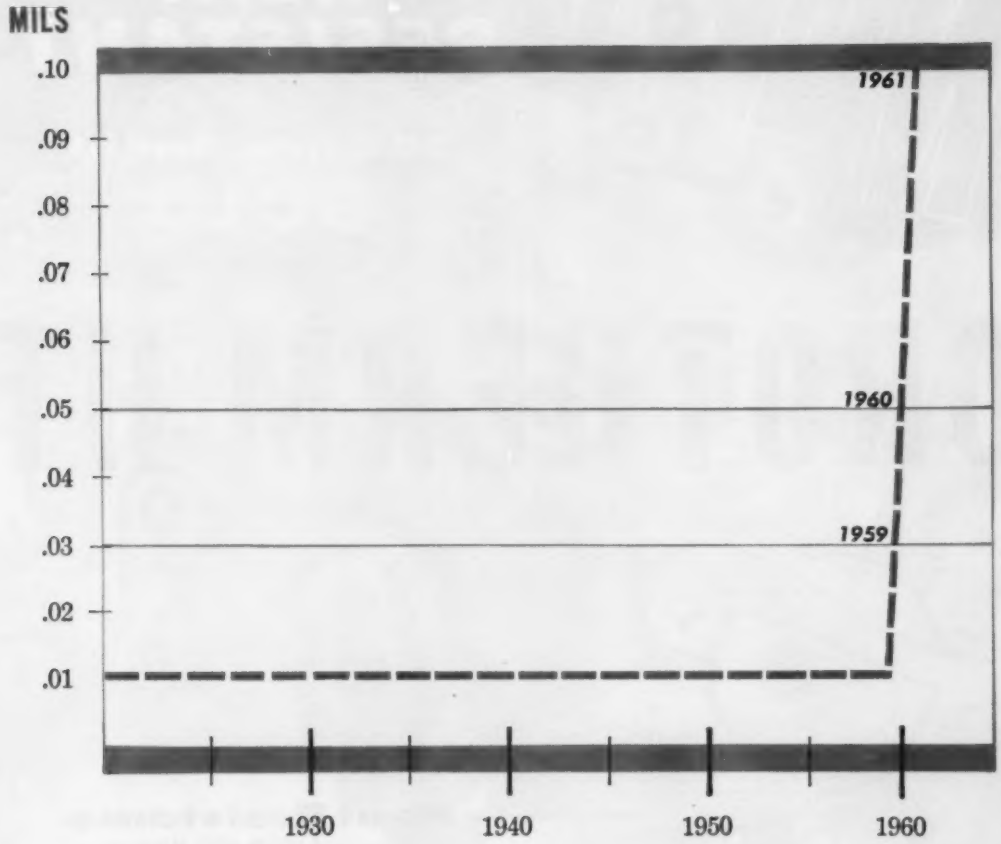

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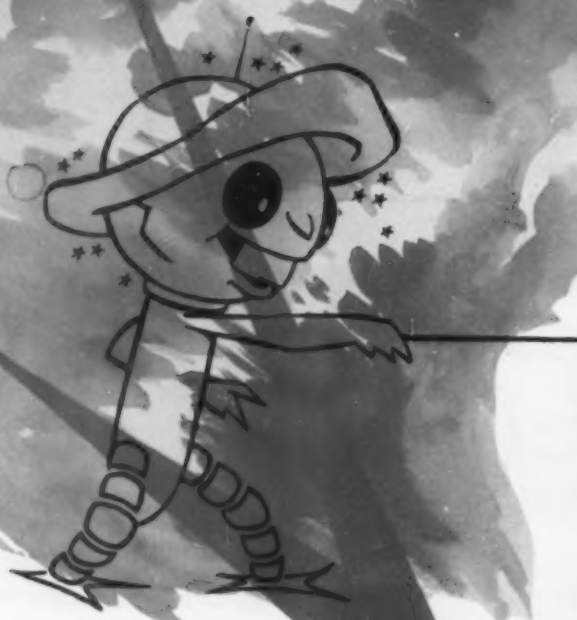

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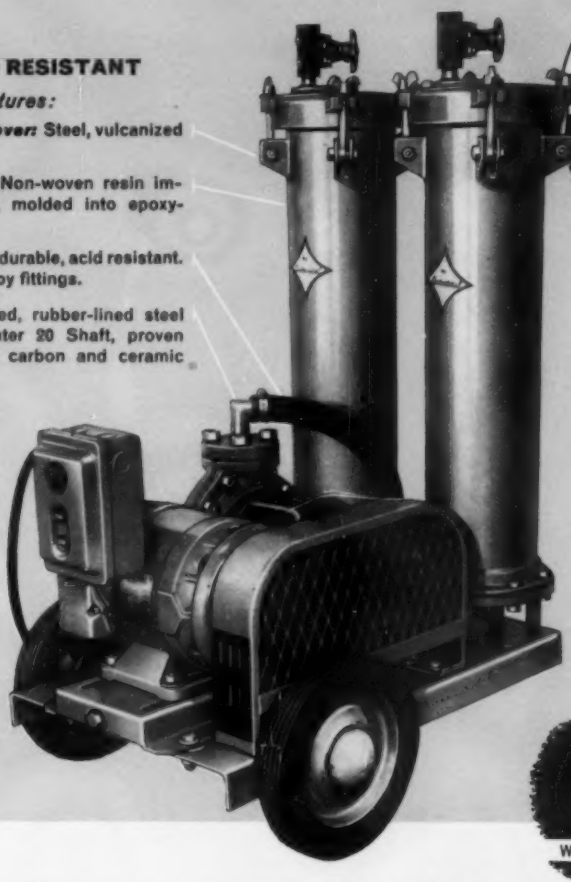
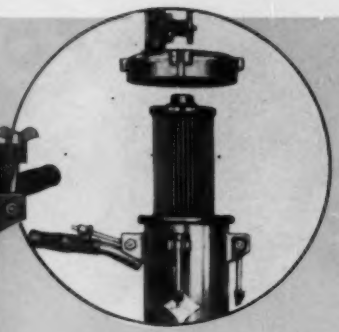
Hose: Three ply, durable, acid resistant. Plastic or Hastelloy fittings.

Pump: Vulcanized, rubber-lined steel chamber. Carpenter 20 Shaft, proven mechanical seal; carbon and ceramic components.





EASY TO CLEAN
Flip-top cover lifts off. Pull-out cartridge can be replaced or rinsed and reused in seconds.

100% PORTABLE
Mounted on two 6" dia. wheels. Full swivel rear coaster insures complete ease of movement.

COMPACT
Is complete filtration *system:* suction and discharge hose, ball check foot valve strainer; motor with thermal overload starter, filter element(s) and pump . . . yet requires only 6 sq. ft. of floor area. You simply plug it in . . . and start filtering, anywhere.

Now you can eliminate the time and expense of bothersome repiping and the need and equipment for separate plating solution filtering stations.

The new type 118 *heavy duty* Industrial filters are rugged, but compact; low in cost but typically *Industrial*-engineered and rubber-lined throughout for corrosion resistance. The heavy duty *Industrial* pump is of the same long proven design employed in hundreds of *Industrial* filters now in plating service.

Look at the features . . . look at the specs . . . look at the *work* capacity. You can get this complete, proven-dependable filtration system in but six *portable* square feet of work area.

WRITE FOR BULLETIN 118.

TWO MODELS AVAILABLE
Single tube 600 gph capacity, is convertible to double tube 1200 gph capacity model shown above.

CHECK THE SPECS:

- 600 and 1200 gph capacity
- 15 and 30 sq. ft. filtration area
- Temperatures to 170° F.
- Unit 50 P.S.I.G. operating pressure
- Fully proven in plating use

INDUSTRIAL FILTER & PUMP MFG. CO.
5914 Ogden Avenue, Cicero 50, Illinois

INDUSTRIAL

P-639

whatever your finishing problem

ACME has—or will design—a machine to solve it

Buffing automobile hubcaps with this versatile, compact Acme two-headed buffing lathe saves time, saves space and cuts production costs. Faster than ever before, and in one automatic high-speed operation this multiple station unit removes "orange peel," pits and other surface blemishes from the curved surfaces of the part. It gives the hubcap an extra smooth, flawless, high-luster finish, ready for plating. ■ This is the kind of efficiency that cost-conscious companies, both large and small, expect . . . *and get* . . . from versatile Acme finishing machines. Basic machine designs achieved over fifty years give Acme customers an advantage of selecting one of many equipment arrangements, even for the most specialized finishing applications. ■ Automotive trim, building hardware, electrical and plumbing fixtures, household appliance and kitchenware, primary metal sheets and coils . . . these are some of the many mass-produced parts and products now served efficiently by Acme machines. If you have a finishing problem call or write for comprehensive catalog today.

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LEADING PRODUCERS OF AUTOMATIC POLISHING & BUFFING MACHINES SINCE 1910

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 615.

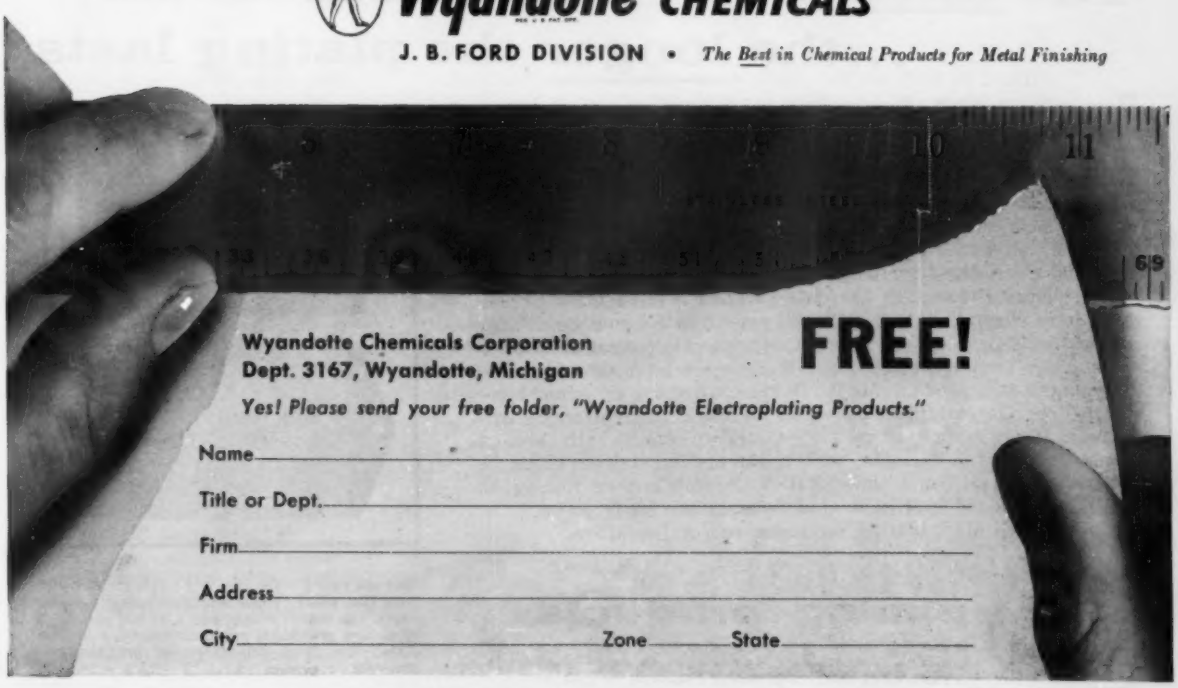
Send for facts on these advanced products for plating preparation!

. . . electrocleaners
. . . soak cleaners
. . . spray cleaners
. . . buffing compound removers
. . . rust and scale removers

This new six-page folder gives detailed information on Wyandotte's complete line of electroplating products . . . job-fitted products like BUFSOL for buffing-compound removal, new LECTRITE Z electrocleaner for zinc die castings, EXPRAY® 541 low-foaming spray cleaner. You'll find it an indispensable guide in selecting the products that fit your procedures best. For your free copy, clip and send the coupon today. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California, and Atlanta, Georgia. Offices in principal cities.*

Wyandotte CHEMICALS

J. B. FORD DIVISION • *The Best in Chemical Products for Metal Finishing*



Wyandotte Chemicals Corporation
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FREE!

Yes! Please send your free folder, "Wyandotte Electroplating Products."

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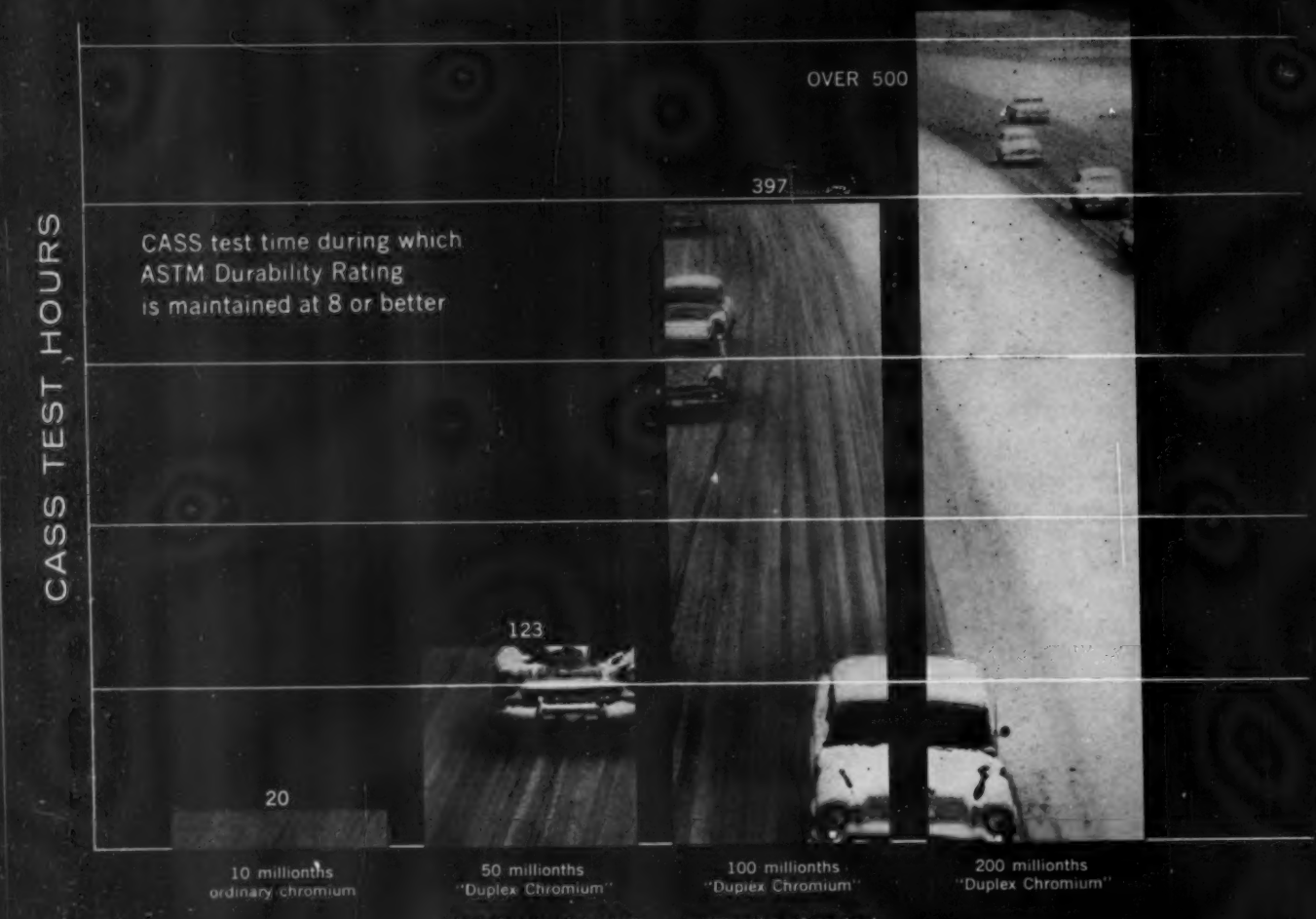

CASS TEST, HOURS
CASS test time during which ASTM Durability Rating is maintained at 8 or better
OVER 500
397
123
20
10 millionths ordinary chromium
50 millionths "Duplex Chromium"
100 millionths "Duplex Chromium"
200 millionths "Duplex Chromium"
CHROMIUM DEPOSIT—in millionths of an inch

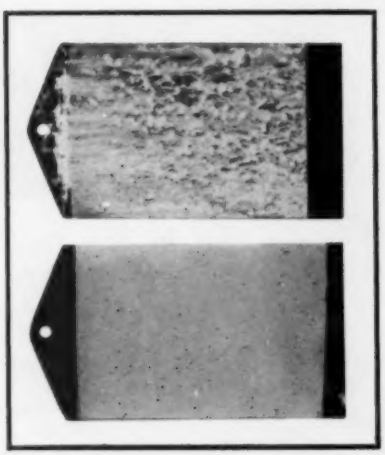
The thicker the "Duplex Chromium" ...the longer the plating lasts

RESULTS with M&T "DUPLEX CHROMIUM" plated over a suitable nickel undercoat confirm that there's a dramatic improvement in durability with 50 millionths of an inch of "DUPLEX CHROMIUM." With 100 millionths it's even better . . . and with 200 millionths, you have the finish of the future.

The graph shows this clearly. These are results with zinc die castings plated with identical undercoats but different chromium topcoats. *Corrodkote* corrosion tests show the same pattern.

Experience shows that the only suitable way to plate thicker decorative chromium is with Unichrome SRHS® solutions. They make possible the correct *type* of deposit. They save production time. They simplify operations. With a combination of two of these baths you produce M&T "DUPLEX CHROMIUM." Unichrome Crack-Free Chromium comes first, to block infiltration of corrosives. *Giving more uniform plate distribution,* this bath deposits ample thickness in recesses, with minimum burning on edges. A deposit of special Unichrome SRHS® Chromium then follows, to minimize localized corrosion at defects in the basis metal.

Send for an M&T plating engineer, or for literature.



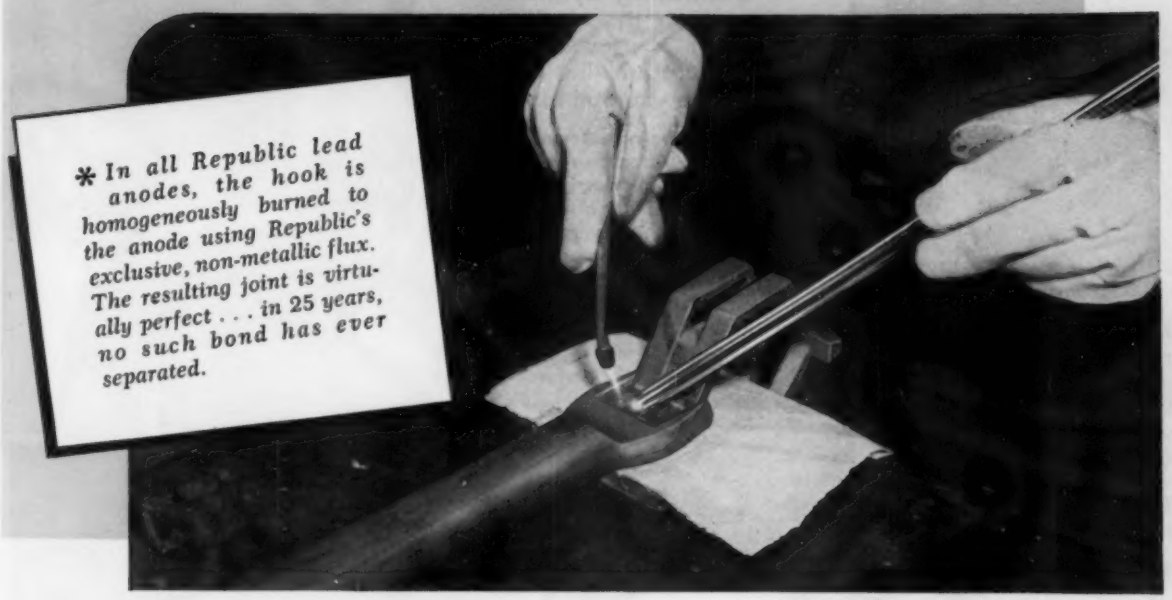
Zinc die cast panels after 272 hours CASS test. Both had same copper and dual nickel undercoats. Top panel, plated with 0.01 mil ordinary chromium gets ASTM rating of 0. Bottom panel, plated with 0.10 mil "DUPLEX CHROMIUM" still rates a perfect 10.

plating products

METAL & THERMIT CORPORATION
General Offices: Rahway, New Jersey
In Canada: Metal & Thermit – United Chromium of Canada, Limited, Rexdale, Ont.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 617.

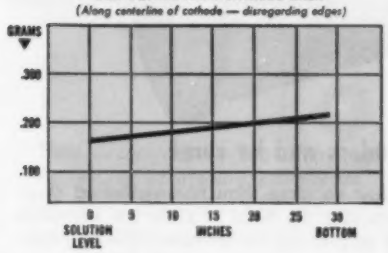
With *Republic* HOLLOW Round Lead Anodes*...



* In all Republic lead anodes, the hook is homogeneously burned to the anode using Republic's exclusive, non-metallic flux. The resulting joint is virtually perfect . . . in 25 years, no such bond has ever separated.

chromium platers get full, even current distribution . . . from top to bottom!

TOTAL WEIGHT OF CHROMIUM DEPOSITED PER SQUARE INCH CATHODE AREA
(Along centerline of cathode — disregarding edges)



Laboratory tests clearly show that current flow is evenly distributed through the entire length of a Republic hollow round lead anode. What's more, this efficient current carrying capacity will remain virtually unchanged throughout prolonged use, because Republic's exclusive homogeneous bonding technique maintains positive electrical contact between hook and anode for the full life of the anode. This means maximum operating economy for the user, as well as better quality work.

Though Republic hollow round anodes provide the same plating efficiency as solid round lead anodes, their lighter weight means appreciable savings in shipping costs and easier handling in your plant, as well as savings up to 25% and more in price.

Get complete information on Republic hollow round lead anodes for chromium plating. Write for your free copy of Bulletin RA-7 . . . today!

ATTENTION REGULAR USERS OF REPUBLIC LEAD ANODES:

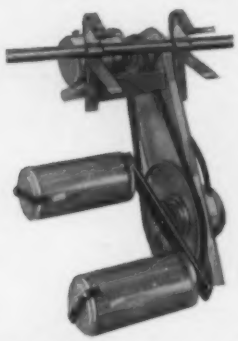
Get additional savings! Let us remelt and analyze your scrap anodes. After adding tin or antimony to restore the original alloy, we will extrude anodes to meet your specifications, furnished, of course, with homogeneously bonded hooks.

1711-A

Republic **LEAD EQUIPMENT CO.**
7930 JONES ROAD • CLEVELAND, OHIO

A UNIT OF THE U. S. STONEWARE CO.

New and Better Plating Barrels



New Ferris Wheel rack-mounted Plater

For quick and easy plating of small lots, tiny parts, samples. 2 or 4 cylinders 6x3¼" I.D. orbit in vertical circle; partially emerge when desired for forced solution change. Cylinders are easily detached for loading or unloading. Flexible dangler contacts. Two spring clamp cathode hooks clamp on cathode rod of still plating tank.

Spring Clamp Hooks for Portoplaters.

Bolt to cathode contacts of standard 6x12, 10x18 and 12x24 Belke Portoplaters. Maintain positive contact—prevent rocking. Gripping bar opens contact clamps; spring action closes contacts when bar is released.

ONLY $198.00 6x12 cylinder 115 V, 60 C

Model SPX

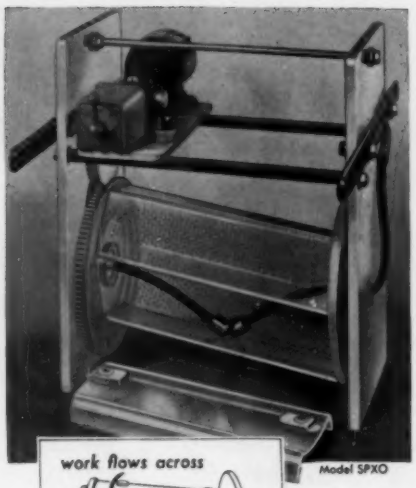
- "V" notch contact; fits any place on cathode rod.
- Self-contained motor drive with reversing switch.
- Obstruction free cylinder.

Oscillating Cylinders Rock as they Roll.

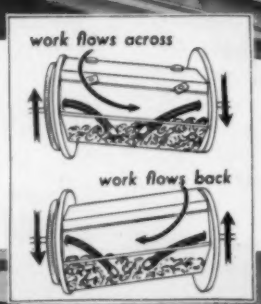
Increased mixing exposes all the work uniformly

This is the big difference. The rocking action moves the work back and forth across the cylinder as it rolls. No work remains shielded by the cylinder ends. All sides of each part are exposed so uniformly to the plating current that a specified thickness deposits much quicker.

Available in all sizes from 14x36 regulars to 6x12 portables. Send for catalog.



Model SPXO



Patent No. 2835664

Choose Double Oscillating Cylinders and be sure!

BELKE Double Oscillating Cylinders cost no more than non-oscillating cylinders. For washers and other flat parts that are hard to plate the improved mixing action is a must. On all kinds of plating the improved mixing action assures uniformity of plating deposit that produces a specified thickness in less time with less metal.

BELKE Double Oscillating Cylinders are available in a wide choice of materials to meet practically any plating condition in complete single or multiple barrel units and as replacements for non-oscillating cylinders.

Send for complete catalog describing plating barrels of all sizes

Belke MANUFACTURING COMPANY
947 N. Cicero Ave., Chicago 51, Ill.

TRADE MARK

EVERYTHING FOR PLATING PLANTS

it's in the bag!

Nickel Sulphate
Nickel Chloride
Nickel Carbonate
Nickel Acetate

Sold exclusively through leading suppliers of plating chemicals. Write for the name and address of the one nearest you.

✻ **CERTIFIED PURITY AND QUALITY** – Only Nuodex "lays it on the line," with an exact *certified* analysis of every batch, attested to by the Quality Control Chemist. This certification appears on every bag of Nuodex nickel plating chemicals shipped to you.

✻ **THE FULL MEASURE OF METAL YOU PAY FOR** – The specifications and certification on the label are your assurance that you get *all* the nickel content you pay for. For example, Nuodex stipulates no release of nickel sulphate without a minimum 22% nickel content.

✻ **100% VIRGIN NICKEL METAL FINES** – All Nuodex nickel plating chemicals are manufactured from virgin metal ores. No recovered, reprocessed or scrap nickel is ever used, to assure you the absolute maximum of purity.

✻ **PROTECTED SOURCE OF SUPPLY** – The virgin metal used in Nuodex plating chemicals comes from an independent Canadian source. This is your insurance against possible future shortage.

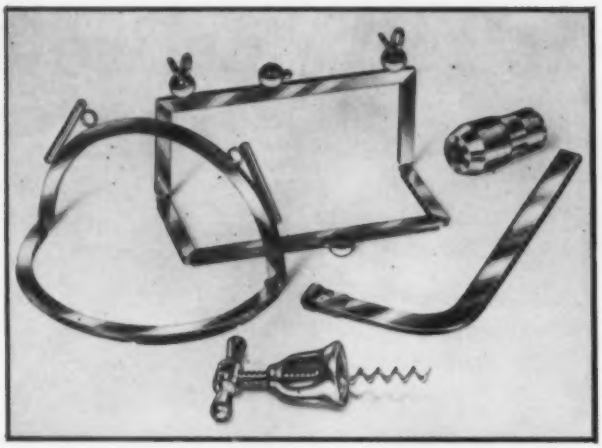
When you buy Nuodex you *know* what you're getting . . . and you *get* all you pay for. Quality controlled . . . value certified, Nuodex nickel plating chemicals are used with confidence—always.

Buy the best . . . it costs no more.

NUODEX special purpose chemicals for industry

NUODEX PRODUCTS COMPANY • ELIZABETH, NEW JERSEY
A Division of Heyden Newport Chemical Corporation

Fungicides • Nickel Salts • Organic Peroxides • Paint Additives • Stearates • Vinyl Additives



DIRECT ON STEEL — No preplating of copper, polishing or buffing. Note particularly the handbag frames. These are semi-fabricated after plating to hold the bag material, which can be safely done with Seymour Bright Nickel because of its superior ductility and adhesion. Also, the brilliance of the knurling on the square handbag frame and chuck are indicative of excellent throwing and hiding power.

THROWING POWER — An outstanding property of Seymour Bright Nickel. Especially necessary in plating such an article as the bent tube shown above, in the slot of which it would be difficult to obtain satisfactory coloring prior to plating, and even after plating. Seymour Bright Nickel is a valuable ally because of its ready controllability to any specified thickness and its fine corrosion resistance.

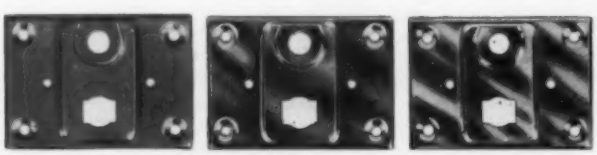
an IMPROVED Bright Nickel Process

HI thro

(PATENT APPLIED FOR)

SEYMOUR Bright Nickel produces a silvery white ultra brilliant deposit over unbuffed copper and direct on raw steel — and for decorative purposes does it with less thickness and in less time than is required by some bright nickels. The saving in time, current and anode consumption should justify your changing over to "Seymour."

It is an organic process free from promoter metal, stable, easy to control, and of excellent throwing power. It utilizes the hot Watts bath. Operating conditions are wide, pH 3.0 to 4 5 (electrometric). Only two replenishment solutions are needed. Deposit is ductile, non-passive, highly corrosion resistant. Any standard 99% plus nickel anode may be used, but we recommend our special-grain "Seycast" Nickel Anode. Full Technical data on request.



BRIGHT DIP — 1. Raw brass, 2. Bright dip, 3. Seymour Bright Nickel. Within a very short time, a high brilliance is secured on matte bright dipped surfaces, showing extreme hiding power.

Electro Chemical Supplies Division

The SEYMOUR Manufacturing Co.

SEYMOUR, CONNECTICUT

Seymour, TUxedo 8-2541 or New York, OXford 7-2390 (TWX: 45)

This is the house that BETTER CLEANERS BUILT!

Northwest Chemical Company was founded with the express idea of supplying BETTER cleaners to the trade. Today, thanks to a steadfast adherence to the policy of top quality ingredients carefully blended with mature experience and pleasingly flavored with good service, Northwest has attained a position of respected leadership in the cleaner field.

A cleaner is only as good as the house behind it. Today's fast changing materials and methods quickly obsolete yesterday's products, constantly creating a need for completely new types of cleaners.

Northwest's continuing research program offers our customers the BEST advanced thinking, no matter what the problem. You are paying for Northwest's plus values wherever you buy. Why not avail yourself of them?

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Armalite Company, Ltd.,
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NORTHWEST CHEMICAL COMPANY

9310 ROSELAWN — DETROIT 4, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 622.

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CYNOREX

BRIGHT COPPER PLATING PROCESS

The only copper bath with these 3 features

1

SIMPLE* OPERATION

Cynorex is the only copper bath with just one non-metallic addition agent. You'll have no juggling of two or three brighteners.

*See Webster's Definition

2

NO CHROME CONTAMINATION PROBLEM

Cynorex is self-purifying.

3

CARBON FILTRATION WITHOUT ADDITION AGENT LOSS

Cynorex can be continuously circulated thru carbon.

HARSHAW

There are more features we'd like to explain to you . . .

contact us at any of the offices listed below.

THE HARSHAW CHEMICAL COMPANY

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Plating Processes also available through the following Foreign Distributors or Manufacturers:

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L. VAN DER HOORN, UTRECHT, HOLLAND
ARMALITE CO. LTD., TORONTO, CANADA
ROBERT BRYCE & CO. LTD., MELBOURNE, AUSTRALIA

And many Agents throughout the world

HARSHAW

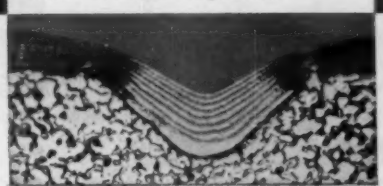
HARSHAW Airglow

AIR-AGITATED BRIGHT NICKEL PROCESS

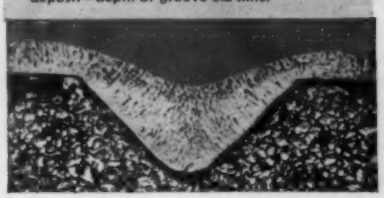
Gives you insurance against air supply failure because it operates efficiently with any agitation system.

Airglow allows the use of current densities much higher than attainable from mechanically agitated systems.

Levelling effects of Harshaw Airglow Bright Nickel deposit compared to that of Harshaw Perflow leveling semi-bright nickel.



TOP: Airglow Bright Nickel—1.5 mil deposit—depth of groove 3.1 mils.
BOTTOM: Perflow Semi-bright Nickel—1.5 mil deposit—depth of groove 3.2 mils.



- Airglow depth of color and brightness unequalled.
- Airglow corrosion resistance—the best of any bright nickel.
- Airglow gives levelling comparable to Perflow levelling!
- Airglow gives economies unusual for bright nickel.

Let us show you!

Allow us to give you the complete story on this outstanding process by contacting the nearest Harshaw office.

THE HARSHAW CHEMICAL COMPANY

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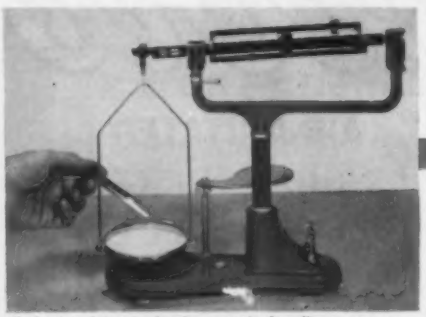
ROBERT BRYCE & CO. LTD., MELBOURNE, AUSTRALIA

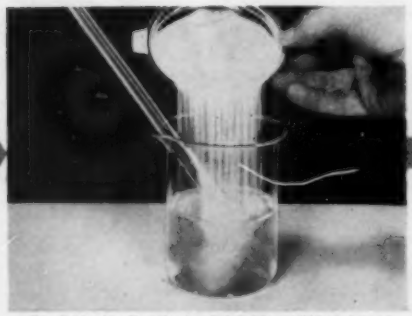
And many Agents throughout the world

Here's how you can save time, and mixing errors with either

New "Direct-Route" Method



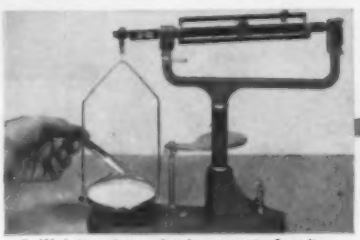
1 Just weigh required amount of sodium-copper or potassium-copper double salt.



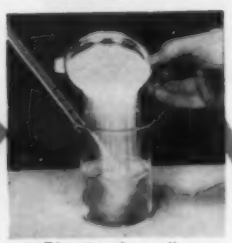
2 Dissolve the desired double salt in water or plating solution.

Laboratory demonstration shows how "direct-route" method saves time

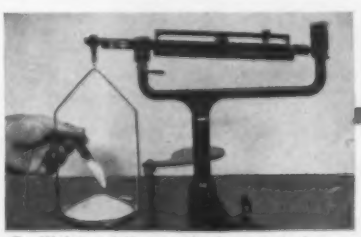
Old "Indirect" Method



1 Weigh out required amount of sodium or potassium cyanide.



2 Dissolve the sodium or potassium cyanide in water.



3 Weigh out the required amount of copper cyanide.

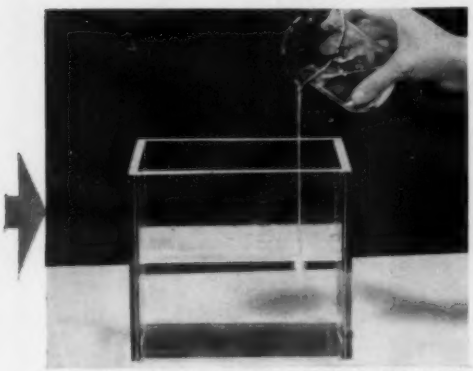
4 Add copper cyanide to water and make a slurry.

5 Dissolve the copper cyanide slurry in solution of sodium or potassium cyanide.

CALL DU PONT FOR ANY ONE OF THESE QUALITY PLATING PRODUCTS. You're assured of superior quality, dependable supply and expert technical service with plating chemicals from Du Pont... your reliable domestic source.

- **Sodium-Copper Cyanide Double Salt**
- **Potassium-Copper Cyanide Double Salt**
- **Copper Cyanide**
- **Potassium Cyanide**
- **All-purpose Cyanobrik® sodium cyanide (in briquette form)**
- **Cyanogran® M sodium cyanide (in granular form)**

reduce handling, avoid waste of Du Pont's Double Salts...



3 Add directly to plating tank—no filtering necessary.

...avoids errors.

6 Add solution through a filter to plating tank.

SODIUM-COPPER CYANIDE OR POTASSIUM-COPPER CYANIDE

SAVE TIME AND REDUCE HANDLING...By using one Du Pont copper cyanide double salt instead of two separate chemicals, you eliminate several steps usually required to dissolve copper cyanide. Just weigh out the Du Pont double salt and dissolve it in water or plating solution. A "direct-route" process! (Compare old and new methods at left.)

AVOID WASTE AND MIXING ERRORS...because active ingredients are in the proportions usually required. This simplifies making and replenishing bath . . . prevents waste resulting from undissolved copper cyanide.

INCREASE CONVENIENCE AND SAFETY...With just one salt to dissolve you minimize handling steps. This means greater convenience—more safety.

Du Pont sodium-copper cyanide double salt and potassium-copper cyanide double salt are white, crystalline and readily soluble. They are made from ingredients of highest quality and purity —Du Pont copper cyanide, sodium cyanide and potassium cyanide.

SIMPLIFY CALCULATIONS...Balanced composition of Du Pont double salts makes it easy to determine amounts required for make-up or replenishment. (1 oz. potassium-copper cyanide double salt is equivalent to 0.26 oz. copper, or 0.37 oz. copper cyanide; 1 oz. sodium-copper cyanide double salt is equivalent to 0.29 oz. copper or 0.41 oz. copper cyanide.)

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	SPECIFICATIONS	TYPICAL ANALYSIS
Copper	28.7% min.	29%
"Free" sodium cyanide	0.4 to 2.0%	1%
Lead	7 ppm. max.	Less than 1 ppm.
Sulfides (as sulfur)	10 ppm. max.	Less than 5 ppm.
Insolubles	0.01% max.	0.01%

POTASSIUM-COPPER CYANIDE DOUBLE SALT

	SPECIFICATIONS	TYPICAL ANALYSIS
Copper	25.8%	26.3%
"Free" potassium cyanide	1.25% to 3.0%	2.9%
Lead	7 ppm. max.	Less than 1 ppm.
Sulfides (as sulfur)	10 ppm. max.	Less than 5 ppm.
Insolubles	0.01% max.	Trace

Both potassium and sodium double salts are shipped in convenient moisture-resistant 100-lb.-net fiber containers.

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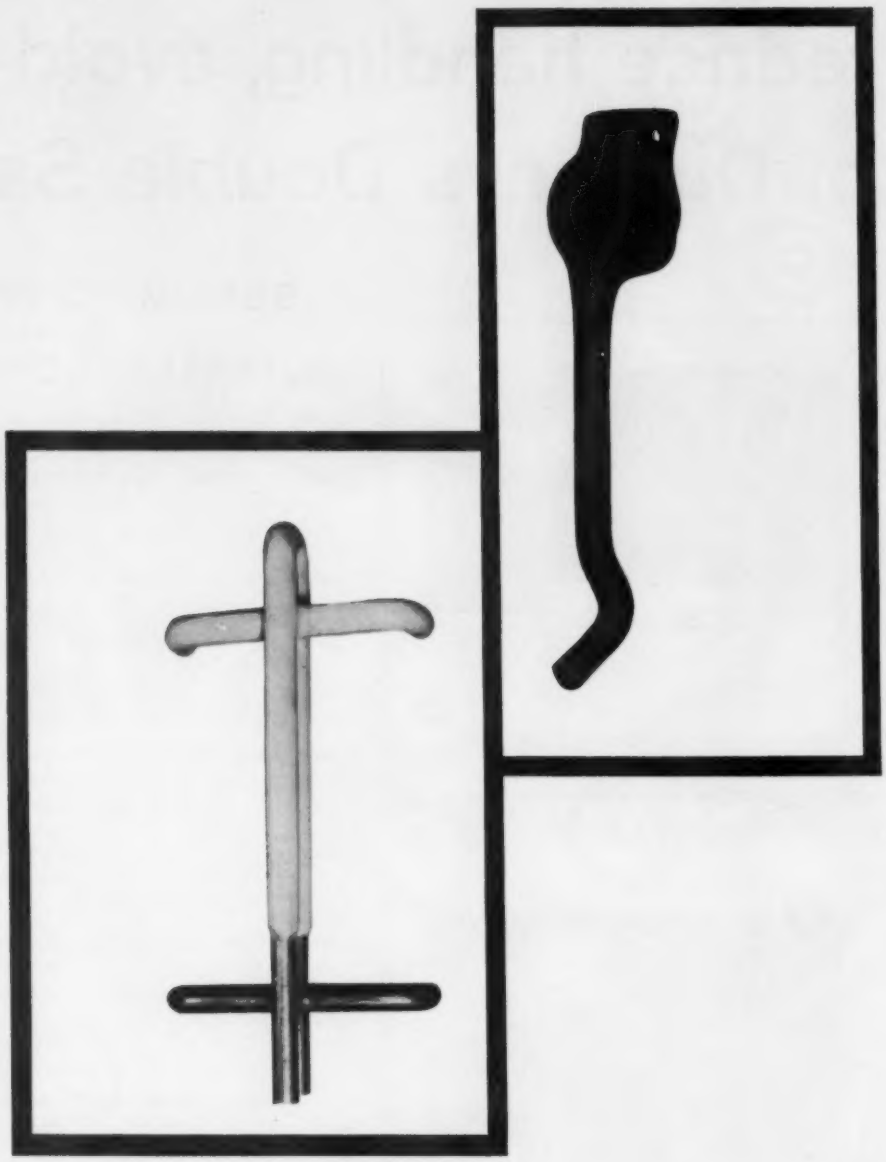

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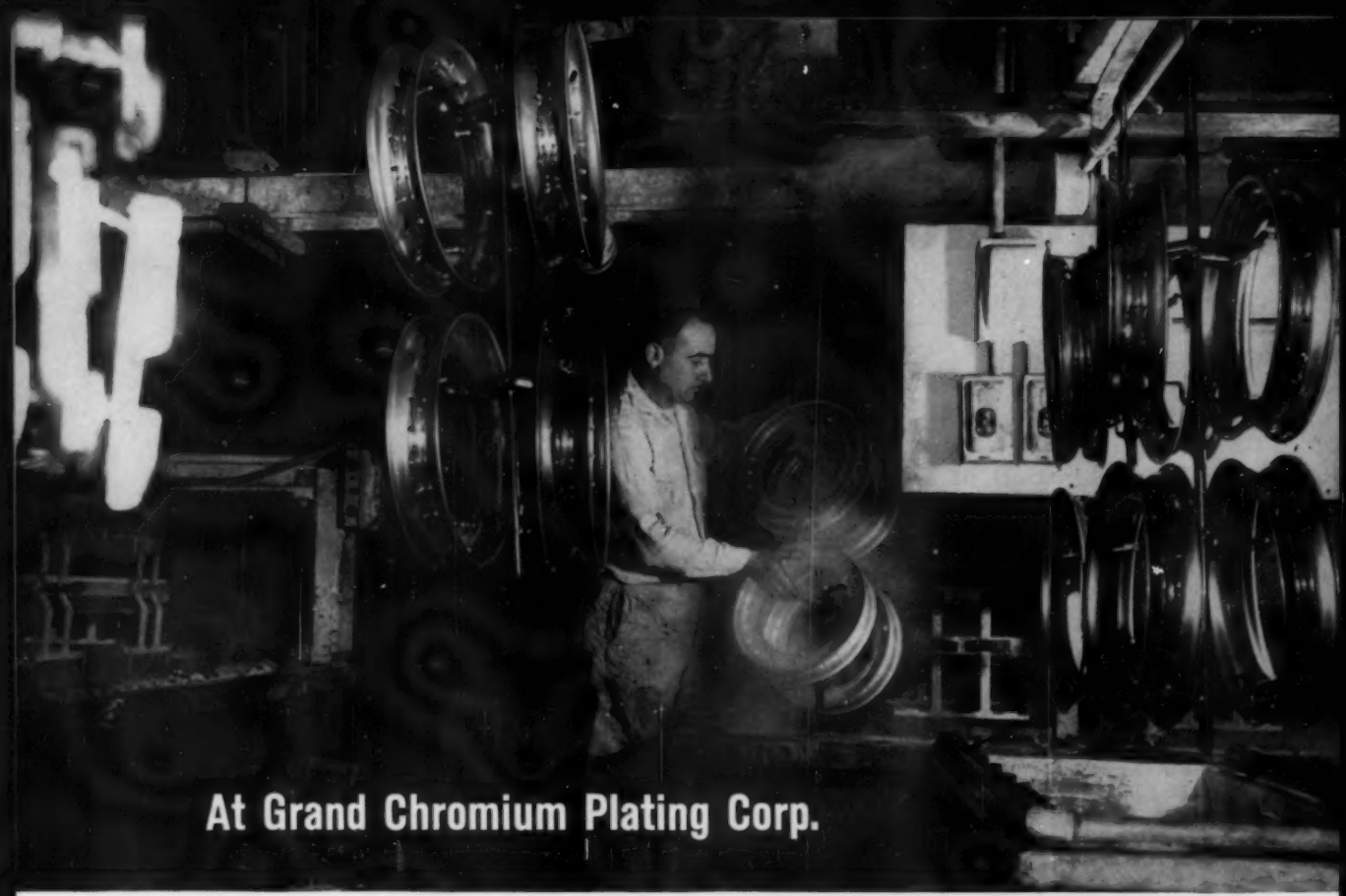

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Following an intensive study of the market for barrel finishing equipment, the Barrel Finishing Equipment Division has undertaken to completely overhaul and reorganize its sales and distribution system. The continental United States has been divided into 22 territories, each territory containing approximately an equal number of actual and potential barrel users. In each territory will be appointed a single, strategically located distributor who shall be designated as Selected Distributor. To the distributor who qualifies as Selected Distributor the following arrangements will be offered:

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3. A Technical Training Course in barrel finishing will be given to all designated Selected Distributor sales representatives at no cost other than transportation.
4. All sales made in the territory will be sold through the Selected Distributor at a "long" discount from list.
5. Any additional distributors in the territory appointed by the Barrel Finishing Equipment Division or the Selected Distributor shall be designated Franchised Distributors and be required to purchase from the Selected Distributor at a "short" discount. Baird will not accept orders direct from Franchised Distributors.
6. A special direct mail program aimed at potential users of barrel finishing equipment in the Selected Distributor's territory shall be executed immediately following appointment in order to develop interest and inquiries. Sales leads resulting from Baird's regular national advertising, publicity and direct mail programs, in addition, shall be forwarded only to the Selected Distributor.

Those distributors who are currently engaged in the active solicitation of business in the metal finishing equipment and supply field are invited to investigate the opportunities afforded them by this plan. The interview of qualified distributors will begin immediately.

If you are interested, write immediately to the attention of "New Marketing Plan," Baird Machine Company, 1700 Stratford Ave., Stratford, Conn.

If you are planning to attend the American Electroplaters Society Convention in Los Angeles, July 24-29, contact Mr. Bennett, Suite xxx, Hotel Statler.

Since only 22 Selected Distributors are currently planned, distributors who are interested are urged to respond as promptly as possible. New England, along with the states of New York, New Jersey and Pennsylvania are not considered available territories.

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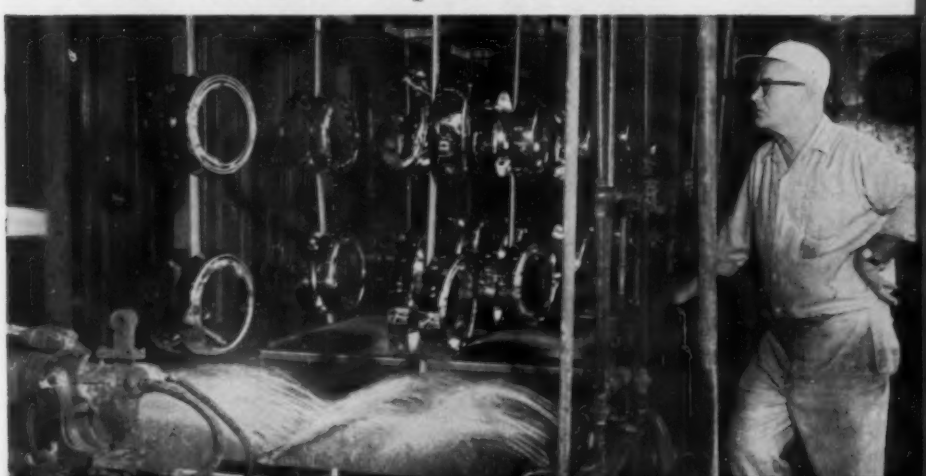

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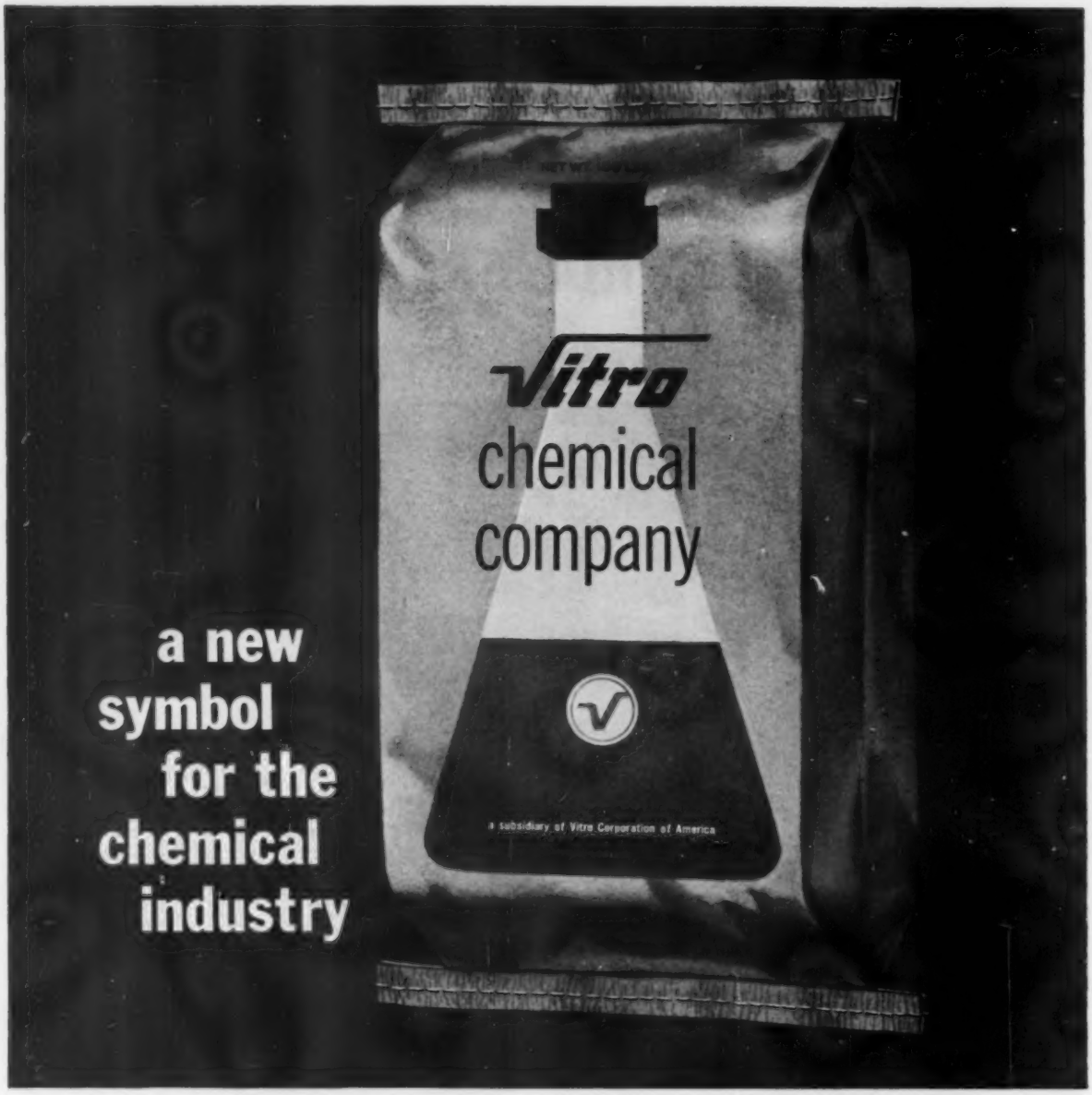

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Photostat or microfilm copies of articles in available magazines may be obtained from: Library of Congress, Washington, D. C.; New York Public Library, New York; Engineering Societies' Library, New York, at prevailing rates. In other cases, consult Wilson's Union List of Serials at your nearest public library for other sources of these articles.

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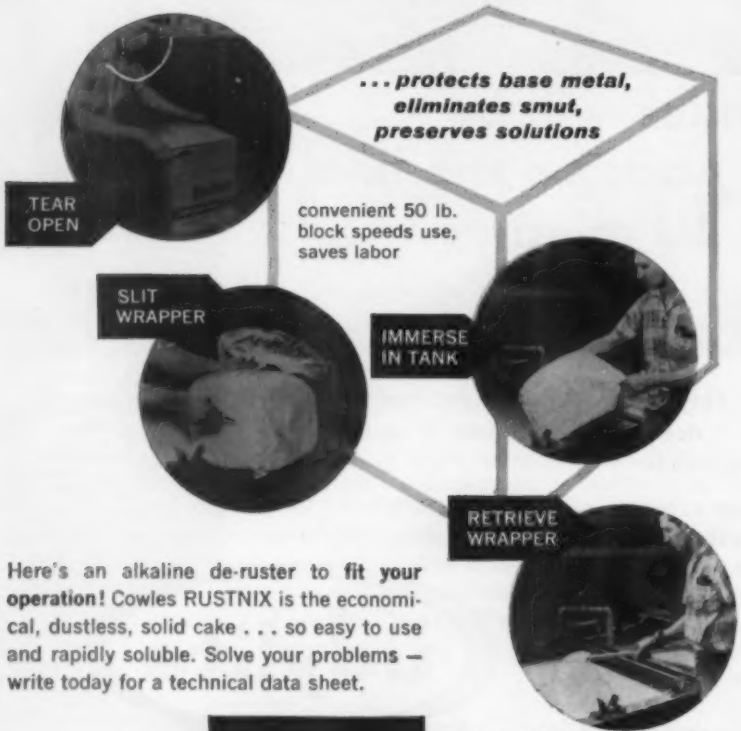
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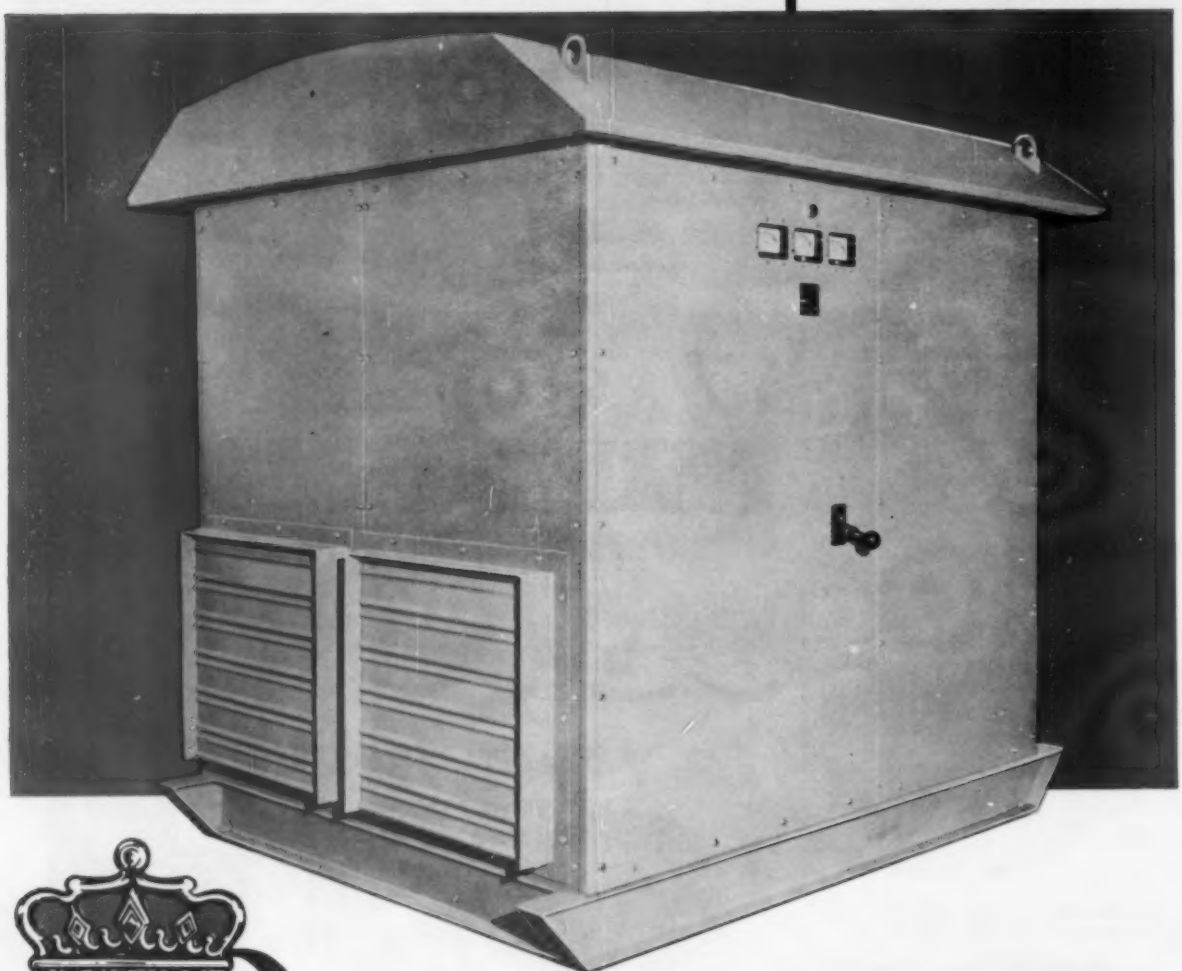

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The unique book contains the full text of each of the 43 technical papers on electroplating, metal finishing, organic coating and allied arts by experts of nine countries, including the United States, England, Canada, Australia, France, Germany, Holland, India and Italy, delivered before the Fifth International Conference on Electrodeposition and Metal Finishing, educational sessions element of the AES's Golden Jubilee Convention held in Detroit, Michigan, June 15–19, 1959.

Embodying, too, the charts, diagrams graphs, tables and other illustrations of each of the 43 published papers, *the book also includes the transcript of the discussion that attended the delivery of each paper.* A full list of the papers published in this voluminous treasure chest of knowledge appears on the facing page of this announcement.

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INTERNATIONAL CONFERENCE: ITS AES HALF-CENTURY SETTING

DRAMATIC and fitting climax of its year-long FIFTIETH ANNIVERSARY observance, American Electroplaters' Society, Inc. (AES) conducted its unique Golden Jubilee Convention and Industrial Finishing Exposition, including the concurrent Fifth International Conference on Electrodeposition and Metal Finishing, in Detroit, Michigan, June 15-19, 1959.

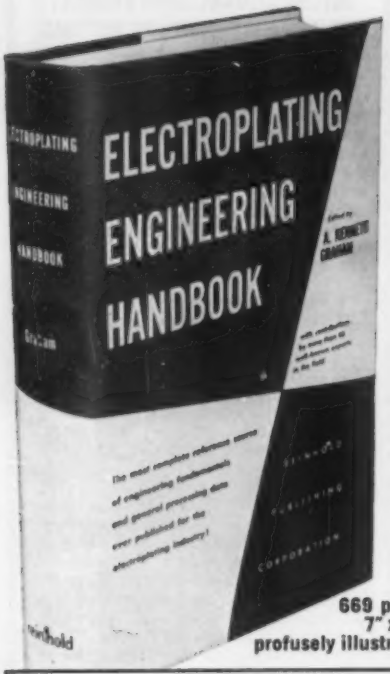
GREETED by the President of the United States, the AES was welcomed to Michigan and Detroit by Governor G. Mennen Williams. The entire week of the AES's Convention, Exposition and International Conference was proclaimed by Detroit's Mayor as "AES GOLDEN JUBILEE WEEK IN DETROIT."

AS the Fifth International Conference on Electrodeposition and Metal Finishing, the Golden Jubilee Convention's educational sessions numbered eleven. Experts from nine countries, including the United States, England, Canada, Australia, France, Germany, Holland, India and Italy, presented 43 technical and scientific papers enriching knowledge in electroplating, metal finishing and allied arts. High spot of the sessions was the first "William Blum Lecture" that was delivered by the eminent Dr. William Blum, first winner of the AES Scientific Achievement Award, the Society's highest honor.

UNDER the supervision of the AES's Editorial Board, in collaboration with the International Council on Electrodeposition and Metal Finishing, the International Conference was planned for the AES by AES Past President Walter L. Pinner, Chairman of the International Council. His Committee included Dr. T. P. Hoar, Dr. Simon Wernick, A. W. Wallbank, R. A. F. Hammond and George Gardam of England and Myron B. Diggin, Dr. Walter R. Meyer and Dr. Richard B. Saltonstall of the United States.

OPENING SESSION OF THE FIFTH INTERNATIONAL CONFERENCE ON ELECTRODEPOSITION AND METAL FINISHING

(1) Chairman Walter L. Pinner extending official welcome. Dr. William Blum, AES Scientific Award winner, seated. (2) Crowded auditorium at the first session. (3) Session Chairman T. P. Hoar introducing Dr. Blum, who delivered the first William Blum Lecture.



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Here are a few excerpts from a review in *Research and Engineering:* "The book is very well written, remarkably free from typographical errors, and shows an excellent appreciation of the problems encountered by the practitioner in the selection of tables and topics covered . . . much attention is paid to definition of all terms used, and it appears that special attention must have been directed toward making each presentation easy to understand . . . The editor and his associates are to be complimented on a fine job, resulting in a volume which may be recommended to all who are associated with the engineering aspects of electroplating."

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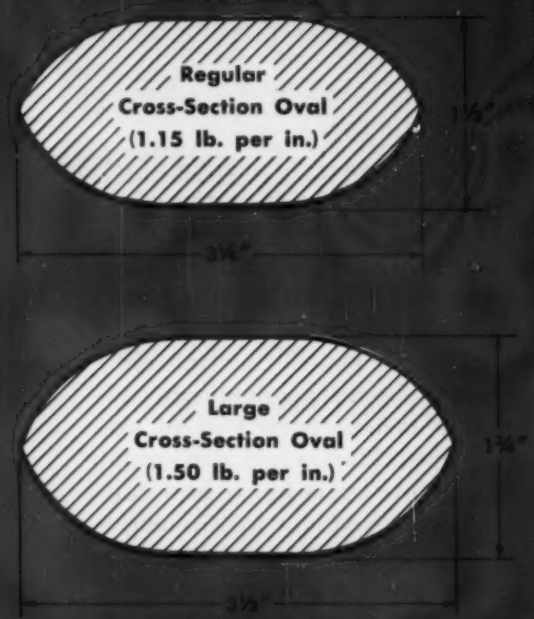

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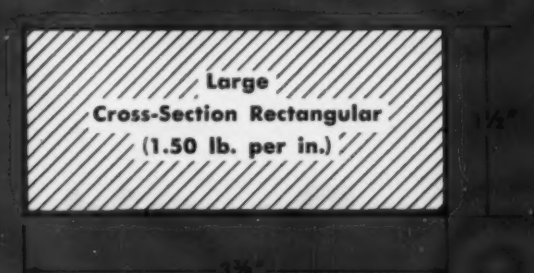

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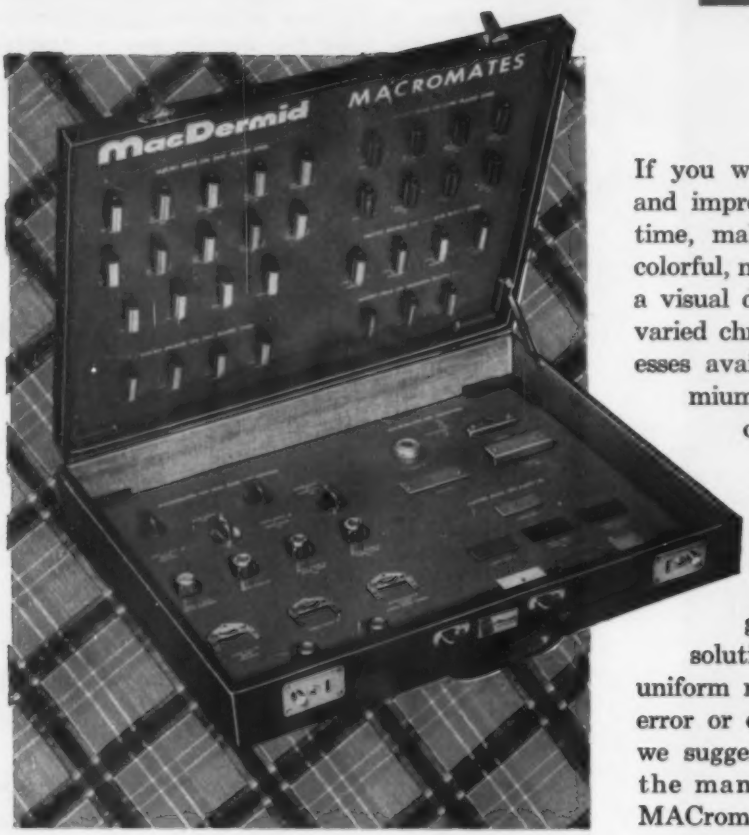

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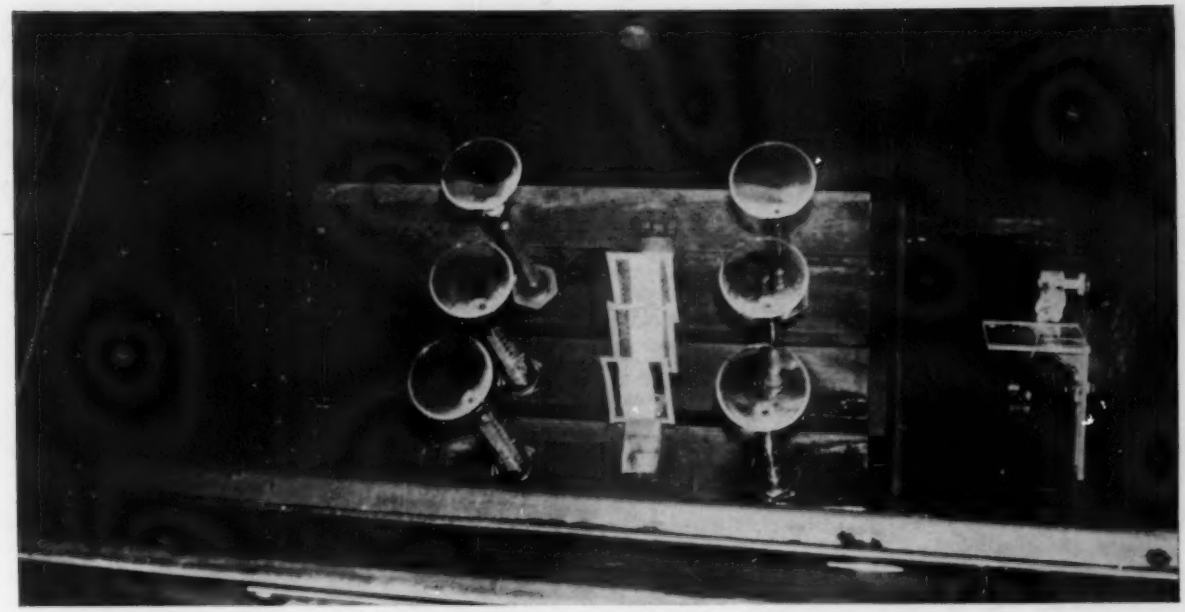

Fig. 1. Specimen Arrangement.

ACCELERATED CORROSION TESTING

by ALLEN FRANK*

The salt spray test is a useful accelerated corrosion test if used wisely and as intended.

Significant details of the historical summation of the 46-year-old salt spray test are presented. There are twenty salt spray cabinet variables presented and the latest information available to eliminate or minimize the effects of these variables to produce a standardized test method. Future plans to use "standardized test panels" and more accurately obtain correlated outdoor vs indoor exposure results are outlined.

ACCELERATED CORROSION TESTING is a very important part of any industrial or research manufacturing program. What are the physical and/or chemical parameters of corrosion potential within the product concerned and how will it perform in service? These corrosion data (deterioration information in the broad sense, for lack of specific terminology) are necessary with the use of any material be it wood, plastic, leather, paper, metal, textile or the like. How to obtain such data quickly, which also would be consistently accurate, is a major problem today for all concerned with quality assurance.

One of the most common test methods for determining acceptable protective quality of organic and inorganic coatings on metal parts has been the Salt Fog test. Some form of this test has been in existence for about 46 years.[1] It has only been within the last 20 years[2] that improvements in control, cabinet design and test evaluation methods have been investigated, resulting in progress toward standardization.

Literature[3,4,37] over the last few years also has been flooded with pro and con discussions of Salt Fog as an effective laboratory test. Opinion at the present time on Salt Fog and related testing still differs on such basic issues as saline concentration; humidity and its control; size and shape of test specimens and their location in the equipment; dimensions of testing equipment; size, shape and location of venting systems; nozzle design, and angle and position of spray; rating and analysis of

*Frankford Arsenal, Philadelphia, Pennsylvania.

results, to mention only a few areas where concentrated effort must be applied to produce more effective "go—no go" tests easily adaptable for specific applications. Many of these variable conditions are now being investigated.

The plating industry in the early 'thirties realized that it needed a reliable accelerated test for anodic finishes on aluminum. The American Electroplaters' Society, through its me nbership, investigated the tests at hand and decided on the Salt Fog test as an acceptable ıethod for evaluating plated items. It was assumed that if the items tested met a certain required time exposure they would meet the general field conditions required of them Accordingly, in 1939 the AES introduced to ASTM, through Committee B-3, a tentative draft of a specification with 20 per cent Salt Fog exposure[5]. The test, ASTM No. B117-44T[6], was adopted in 1944 but much controversy arose between buyers and sellers of metallic plated parts on the merit of the accumulated test data. Since the test failed to show proper correlation with service performance of plated items, both AES and ASTM authorized General Motors Corporation to study ways and means to overcome difficulties of this test method.[9] Several years of work resulted in the recommendation by this research and development unit to replace 20 per cent Salt spray with a 5 per cent by weight neutral salt spray.[26,37] While a 20 per cent concentration could be made to work well on certain plated items, and was less sensitive to temperature changes, the same reproducible data could be obtained in substantially the same time, or in some cases in much less time, using the 5 per cent solution.

The aluminum industry still used the 20 per cent Salt Fog Spray Test on anodic coatings although admitting the 5 per cent solution provided a more accelerated test. The 5 per cent salt spray test did not require the exacting supervision which the 20 per cent necessitated due to lack of salt crystals forming on and in the nozzles. The savings in labor and materials and the advantage of higher humidity in the testing of organic coatings, made the 5 per cent test more desirable.

ASTM Committee B-3 noted the 5 per cent Salt Spray in 1951.[9] After much discussion, it was adopted by them in Method No. B117-54T in 1954 in place of the 20 per cent test.[12]

ASTM Committee B-3 Sub III continued investigations because it was found that normal (sodium chloride) salt spray could not duplicate the blisters found on plated zinc die castings in service.[9] Again the motor industry "took the bull by the horns"—this time in two separate directions under the watchful eyes of AES and ASTM.

In 1952 AES set up Research Project 15,[7] charged with the responsibility, through basic research, of establishing a test method to produce results that would correlate more closely with those of outdoor exposures. This group is currently investigating the correlation that exists between the more common accelerated testing methods and the corrosion produced by the ambient atmospheres of Detroit, Michigan and Kure Beach, North Carolina. The Research Committee is also attempting to standardize laboratory accelerated corrosion methods and techniques. It is this organization that provides ASTM with proven data for evaluation in connection with the adoption of standardized test methods. AES Research Project 15 consists mainly of representatives from the automotive industry and its suppliers.

In 1945 C. F. Nixon of General Motors issued a report titled "A Modified Salt Spray Test for Chromium Plated Zinc-Base Die Castings".[8] Within this report was the nucleus of the Acetic Acid modification of the Salt Spray Test. With the advent of AES Project 15, the acetic acid method was further developed by General Motors[9] through Project 15 participation. The Corrodkote Test,[10] a product of the development laboratory of Houdaille Industries, was also introduced to Project 15. Both of these methods have been continuously studied and in the July 1957 issue of PLATING MAGAZINE, the Project 15 Committee described in their Fourth Progress Report the latest "tentative procedures for the conduct of two accelerated methods for testing the out-of-door durability of chromium plated steel and zinc alloy parts."[11]

Through the efforts of the Acetic Acid Task Force of ASTM Commitee B-3, Sub Committee III, under the leadership of Wardley D. McMaster, (assistant head, chemical department, Research Laboratory Division, General Motors, Detroit) the Acetic Acid Modification was adopted in 1954 as tentative Standard B287-54T.[12]

General Motors research facilities, on the recommendation of Project 15, have improved the correlation of exposure test data more completely and thoroughly through the addition of small amounts of copper salts in the normal and acetic acid salt spray tests.[13] This continuing endeavor is being reported through Project 15 to AES and ASTM. Copper chloride and copper nitrate are being added to the salt bath in the concentrations of about 1 g/gal of solution. It has been found that with the elevation of test temperature from 92-97F (present test methods) to 120F ± 1 or 2° (bubble tower temperture 130 to 135F), the rate of corrosion attack is speeded up in the order of four to six times over the present test methods. Comparison with specific outdoor studies indicates a definite laboratory exposure time/outdoor exposure time relationship. The addition of copper is relatively new and its use has been limited. However, there has been an indication that, with use of copper in the acetic acid method, the corrosion acceleration for plated zinc base die castings is somewhat greater than for plated steel parts.

The Corrodkote Method, refined by Chrysler[14] for AES Project 15, involves the use of cupric nitrate, ferric chloride, ammonium chloride and Florida Kaolin in a distilled water slurry. The slurry is brushed on the part to be tested and smoothed out in one direction. After an hour of air drying, this part is placed in a non-condensing humidity cabinet for 24 hours exposure at 100F with 90 to 100 per cent relative humidity.

In testing zinc die castings the slurry is removed from the surface with running water, the part dried and inspected and rated according to a definite rating system. For steel parts the rust spots on the slurry are counted only for the purpose of record before the slurry is removed with running water. The part is then placed in a condensing humidity cabinet for 24 hours at 100F with 100 per cent relative humidity. An alternative is to use a salt spray cabinet for four hours. After the second exposure the items are re-inspected and the condition of the plated surfaces are evaluated by a predetermined rating system.

Both the Corrodkote and Acetic Acid methods have shown correlatable time exposure results between themselves, as well as between them and exposures to Detroit and Kure Beach atmospheres. The latest findings of AES Project 15 are being submitted through ASTM Committees B-3 and B-8 in an endeavor to give industry a workable test.[15]

In 1957 the acetic acid-copper-salt spray method was adopted by a leading manufacturer as a laboratory acceptance test for procurement of nickel-chrome plated parts, with much success.[13]

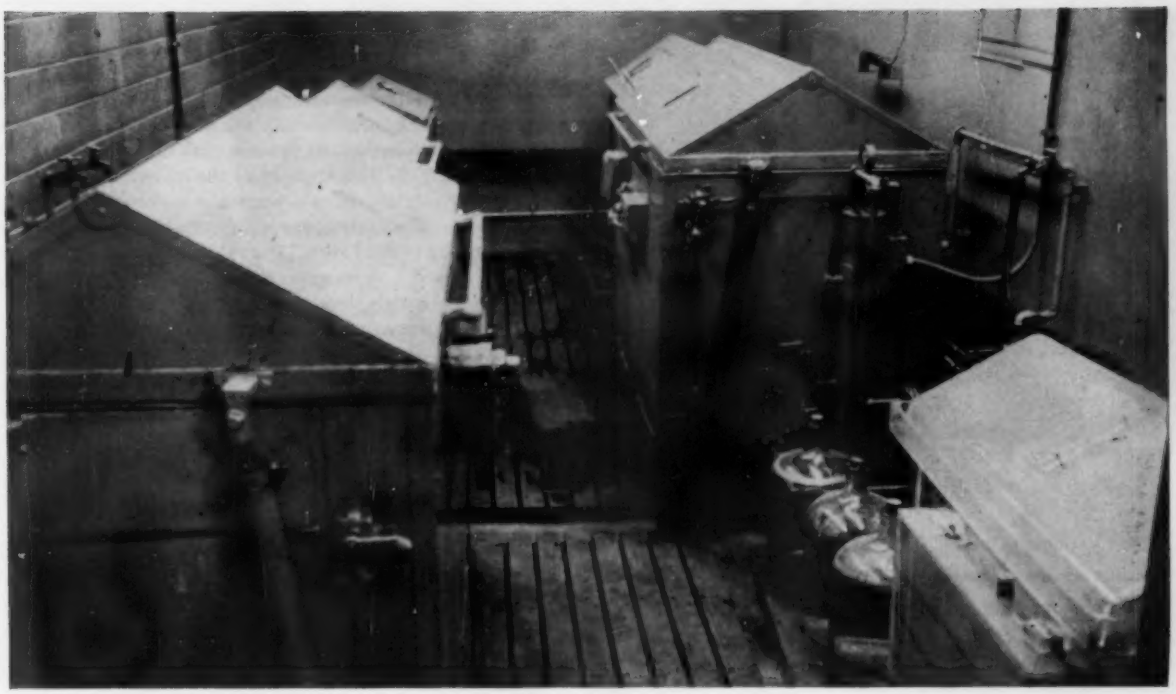

Fig. 2. Conditioned Room for Salt Spray Chambers.

Various government agencies,[16,17] industry,[39] AES and ASTM are all pushing forward. It certainly can be expected that the future will hold better accelerated corrosion test methods.

How to combat the situation involving inconsistency and non-conformity of plating operations, non-uniformity of plated coatings, erratic composition of basis metal and extreme conditions of field use, presents a momentous project that is a challenge to the very best thinking of any plater. What must be done in the plant to make information available which may predict the service life of a plated item? There are the humidity tests,[18] accelerated weathering tests,[19] Corrodkote test, acetic acid-salt spray test, sulfur dioxide test,[20] copper additions to salt spray tests, 5 and 20 per cent salt spray, immersion tests,[21] stress corrosion tests,[22] hydrogen embrittlement tests[23] and a few others.[24] Each test has its own peculiarities and the results of any one test method on any one type of finished item differ between laboratories, between the specimens themselves and between the test methods employed.

Improved control of methods and techniques to standardize on an accelerated corrosion test is urgently needed. A study has been undertaken by the Climatic Section of the Test and Evaluation Branch, Pitman-Dunn Laboratories Group, Frankford Arsenal to investigate and improve salt spray testing and its operational techniques.

The attempt is being made, through this test program, to ascertain:

(a) The variables in standard acceptance salt spray testing procedures, techniques and conditions within our installation.

(b) The reproducibility of exposure results of selected metal specimens within different standard spray cabinets.

(c) The effects of chamber variables, with a view toward controlling, minimizing and standardizing them.

(d) The variables and operating technique for calibrating salt spray chambers; to standardize them so they may serve as a dependable tool for standard acceptance testing procedures and specification needs in accelerated corrosion resistance measurements.

Through planned investigation the test program is attempting to ascertain the extent of cabinet variability and possibility of eliminating some of the following known variables.

(a) Position of specimens within the cabinet.

(b) Angle of inclination of specimens within the chamber.

(c) Variation of interior volume of the cabinet.

(d) Cabinets of different manufacturers.

(e) The use of lined and unlined, insulated and non-insulated cabinets.

(f) Fog particle size and fog collection rate.

(g) Atomizing pressure and design of atomizer.

(h) Effects of distilled, detonized and ordinary city water and air.

(i) Location of chambers relative to other influences, e.g. direction of venting to outdoors, prevailing winds, back drafts, height above ground.

(j) Effect of sample rotation within the chamber.

(k) Volume of air in the saturator towers and entrance and exit temperature from towers.

(l) Effect of controlled vs uncontrolled ambient atmospheric conditions surrounding salt spray chambers.

(m) Cabinet venting systems.

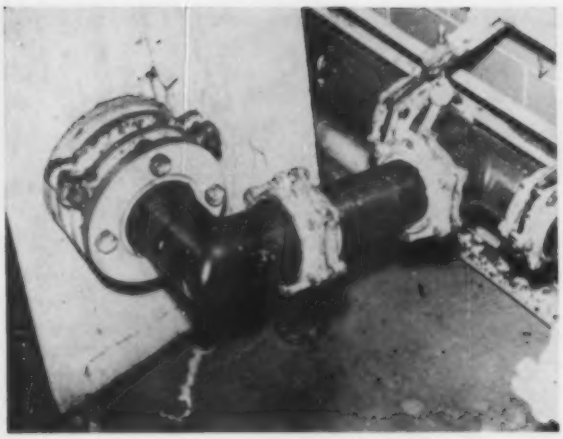

Fig. 3. Side Venting at Specimen Level.

(n) Variable of *p*H.

(o) Variable of specific gravity.

(p) Use of a baffle plate and its angle.

(q) Periodic cleaning of equipment.

(r) Internal cabinet variable of temperature and humidity.

(s) Type and grade of salt used.

(t) Preparation and use of salt solution.

Investigation of cabinet variability was undertaken and the following are the results and recommendations at the present time.

Positions of Specimens Within the Chamber

The position and attitude of specimens within the chamber have been found to be critical with all types of chambers. The area six inches from each side of the salt spray cabinet, with the exception of the trough side, should be avoided for exposing specimens. (See Fig. 1) Collection rates, if taken in this area, are extremely erratic and there is the ever present danger of spill-over from the seal when the cabinet lid is opened or closed. Operational techniques can be gradually developed by the technician to minimize spill-over. This phenomena is unavoidable, but is ever present.

Specimen Angle of Inclination

Inclination angles of 10 to 60° from the vertical have been tried.[25,26] The government specifications and ASTM have adopted the inclination angle of 15° from the vertical as a standard position for specimen exposure.[27,28] They also specify that all test items shall be so placed within the chamber so that their significant surface shall be parallel to the principal direction of the horizontal flow of fog from the spray nozzle.[27,28] This angle gives the specimen a chance to collect electrolytic condensate upon it and yet let the condensate run-off without delay. Any greater angle of inclination from the vertical than 15° would slow down the condendensate run-off. A lesser angle might possibly give lower corrosion potentials since the electrolyte may not be on the surface long enough to induce corrosion. This angle also allows close spacing of specimens without masking one another.

Sample Rotation Within the Chamber

Samples should be so placed that the significant surface meets the conditions given above. These are good for flat surfaces for such items as panels and specimens where just the one particular surface is important. However, samples for testing do not always come in this form. Often cylindrical shapes, such as shells and casings, are involved. Here the entire surface area is important. To equalize the salt spray effects on these samples they are rotated 90° every 24 hours during exposure. Items such as these are sometimes scored to the base metal prior to exposure to observe undercutting and other characteristic corrosion phenomena. When scoring is evident, the samples are not rotated. When testing small items that are usually suspended from rods by nylon string the rods are rotated 180° every 24 hours.

Interior Volume of Cabinet

Results observed regarding the interior volume of cabinets do not lead to a specific conclusion. We load our chambers to a maximum of 50 per cent of their volume. The amount of spray necessary for uniform collection rates increases with the interior volume of the cabinet. This shall be discussed later.

Cabinets of Different Manufacturers

Studies of cabinets of different manufacturers are insufficient to be meaningful at this time. It is intended to obtain and correlate data on salt spray rooms as well as chambers in future studies.

Fig. 4. Outside Venting at Ground Level—Several Chambers.

Lined and Unlined, Insulated and Non-Insulated Cabinets

Lined cabinets, especially those with linings of heavy-gage synthetic rubber free from halogen and sulfur compounds, eliminte the possibilities of contamination where free metal may be present to set up galvanic action and induce corrosion.

Fog Particle Size and Fog Collection Rate

To study the phenomenon, connected with fog particle size and fog collection rate, collection apparatus was set up using 18 units throughout the spray chamber as shown partially in Fig. 5. Daily readings were recorded from each of the graduates of the amount of solution collected, its specific gravity and *p*H. This was done using trough solutions of deionized water, distilled water, 5 per cent salt spray, 20 per cent salt spray and copper-acetic acid salt spray. We followed the practice of most investigators by maintaining collection rates between the limits of 0.5–3 ml/hr collected over 80 cm^2 of surface area.[26,27,29,30] The funnels shown in Figs. 1 and 5 are of that area at the mouth. Collection rates varied and these were traced to venting problems, spill-over, atomizing pressure and temperature. The pattern of the collection rates observed over a period of time indicates that once the spray leaves the atomizer nozzle and hits the baffle plate, it is dispersed in a circular swirling motion across the cabinet. If the cabinet is side vented (directly opposite the trough) collection rates throughout the cabinet appear to be more uniform. If the cabinet is center vented collection rates have a tendency to drop off as the distance from the nozzle increases, especially the area past the center vent. In our studies thus far, it has been found that an increase in atomizing pressure will slightly increase the collections in that area. Uniformity will depend on the size and location of the vent. It is recommended that the spray nozzles be set to deliver about one gallon of spray in 24 hours for each 12 cubic feet internal working volume of the cabinet or room.

*p*H and Specific Gravity

Specific gravity and *p*H readings during collections were fairly uniform, except where spill-over from the water seal had contaminated the trough. This can be avoided by masking the trough with a drain board sloping into the drainage section. In the acetic acid salt spray test there is difficulty in obtaining and maintaining the *p*H of 3.2.[29] Investigation at this time shows that finer *p*H adjustment technique is necessary. Our daily readings for *p*H are taken in 5 ml samples on the Beckman Model G *p*H meter. Specific gravity measurements are taken by the hydrometer-graduate method. Recently a Fisher-Davidson Gravitometer was acquired for measuring the specific gravity of small quantities of solution. We intend to use this in future studies.

Baffle Plate Angle

Reports from the field vary with respect to the preferred baffle plate angle. At the present time we cannot confirm or disclaim that a baffle plate set at a 45° angle to the vertical of the cabinet at a distance of 1 to 2 inches from the nozzle will give maximum results within small chambers. It may be theorized, however, that such is best. ASTM, at present, states "the nozzle or nozzles shall be so directed or baffled that none of the spray can impinge directly on the test specimens".[27,28] This gives wide latitude in any arrangements. Radiation, Inc. of Florida did some work for Wright Field in which they multi-baffled a small chamber in an attempt to obtain even distribution of fog[16]. Their results were not too encouraging.

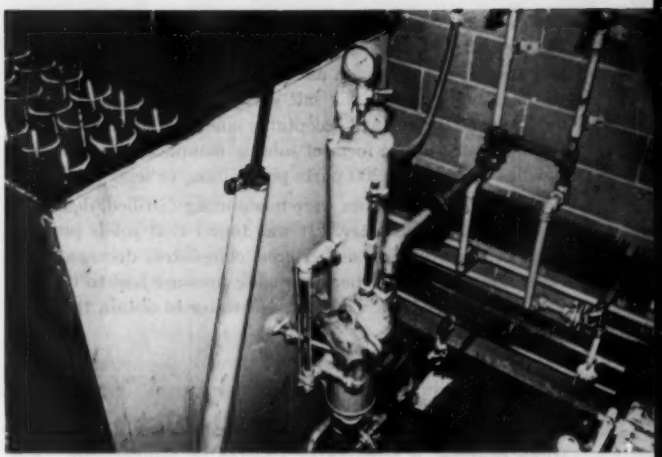

Fig. 5. Salt Spray Chamber Controls.

Atomizing Pressure and Design of the Atomizer

The atomizers have been made of glass, Monel metal, hard rubber and plastic. We normally use the plastic type, although the Monel metal is more rugged and less susceptible to breakage. The atomizer has no special design. The only important requirement is the delivery of the required amount of atomized solution at a constant pressure per unit of time; 1 gal/24 hr is the present rate.[27,28] Each nozzle has its own peculiarity and no two nozzles emit the same fog spray, other conditions being equal. Each nozzle should be adjusted to produce the desired collection rate by means of an adjustment of air pressure for the particular chamber used. When using 20 per cent salt spray the nozzles tend to clog up and must be cleaned more frequently than those used with other sprays. It is good policy to replace and clean nozzles at least once a week on long tests or after each short test of 96 hours or more.

In recent correspondence with Industrial Filter and Pump Manufacturing Company,[31] they indicate that they are engaged in a research program on pressure vs collection rate. It is expected this study will be finished by mid-1960. The results should be of great interest. In the same correspondence, the company reported inconsistency of performance of the atomizing nozzle which would "vary with the manufacturing quality control and the specified tolerances—they (the nozzles) would be enlarged due to normal wear or careless cleaning". On the subject of cleaning, Industrial Filter recommends cleaning the three air jets of the suction jet by "the use of the shank of a No. 70 drill".

The cleaning method we follow is upon removal from the chamber the nozzles are immersed in a dilute solution of hydrochloric acid and calgonite (Fisher's Sparkleen is also recommended). The solution and contents are brought to about 150–160F for about 20 minutes; the nozzles are then rinsed with warm water. This treatment is repeated if necessary.

Distilled, Demineralized, Deionized and Ordinary City Water and Air

The air and water used in producing a spray should be free of dust, dirt, oil, foreign gases and other contaminations

which may create an abnormal increase in corrosivity. Passage of air thru heated water towers will heat, humidify and wash out gases such as sulfur dioxide. Use of distilled water is preferred for the salt spray test, but demineralized or deionized waters are acceptable since the minerals within the water are in the form of soluble complexes and the impurities are usually 200 parts per million, or less.

Collection rate studies were made using distilled, deionized and ordinary city water. It was found that solids present, even in the form of sequestered complexes, decreased the collection rate. A higher atomizing pressure had to be used with city water than with distilled water to obtain the same collection rates.

Temperature and Humidity

The rate of corrosion of exposed samples within the salt spray chamber is remarkably affected by temperature. For 5 and 20 per cent salt spray 92 to 97F with 84 and 96 per cent RH respectively have been selected for optimum operation. Acetic acid salt spray uses 120F ± 1 or 2° with over 90 per cent RH. Operation of the chambers at a constant temperature and humidity is essential for reproducible results. These variables are easy to control. Three methods being:

(1) Placing cabinets with a temperature controlled room.

(2) Heating the surrounding water jacket.

(3) Heating the incoming air.

Controlled Atmosphere vs Ambient Atmospheric Conditions Surrounding Salt Spray Chambers

The room shown in Fig. 2 is temperature controlled. Note also that solutions for salt fog are stored in this room ready for use. Many laboratories have single spray cabinets in non-temperature controlled rooms. There heaters maintain the temperature of each individual cabinet separately. Much data is available on both systems of operation.

Location of and Types of Venting Systems within Cabinets

The type and location of venting systems have not been completely studied although data is available to support the theories previously offered in this paper. Many forms of venting are in use. Figure 3 shows a three-inch side vent at specimen level. The vent is directly opposite the solution trough. Collection rates are uniform across this chamber. Other chambers may vent near the top of the side directly opposite the trough. At least one such chamber exhibits uniform collection throughout. Figure 1 shows a one-inch center vent to the rear of the cabinet. Here collection rates are fairly uniform from the spray to the vent area. Then the rate begins to drop towards the opposite end of the box. As mentioned previously, this non-uniform collection rate is overcome to some degree by increase in air pressure.

After the spent spray leaves the chamber the vent system to the outdoors becomes another variable. Returning to our 3-inch vent (Fig. 3) note that this glass vent *slopes* into a 3-inch drain line to the outdoors. This drain to the outdoors is pitched 5 inches downward to allow for proper drainage of condensate. Many installations vent vertically and horizontally with no slope, or have a positive driven venting system using a fan to drive the spent spray upwards and outwards or to a roof vent. Here the problem of condensation is ever present with the condensate usually running back into the chamber. To alleviate this, traps are sometimes placed in drain lines and periodically emptied or a trap leading to a floor drain is present. We favor the three-inch drain at specimen level with venting to the outside on a 5° or greater downward pitch. We are currently collecting positive data on this.

Location of Chambers Relative to other Influences such as Direction of Venting to Outdoors, Prevailing Winds, Back Drafts, Height Above Ground, Etc.

Figure 4 shows the vent to the south at ground level. These are the vents of the conditioned salt spray room containing the six chambers shown in Fig. 2. This exhaust line has the 5° slope. Each vent takes care of one side of the room or three chambers. When only one or two chambers are in operation the vents of the other chambers on each side must be plugged with stoppers, or spent spray will back up into the chambers not being used. On days when the humidity is high, the spent spray seems to stay in the system longer and its movement will depend upon the pressure exerted by the nozzles. Back draft has never been a problem. Upon windy days the spent spray moves along more rapidly thru the vent system.

In installations where there are single cabinets, there are usually no complaints for they are "within the specifications". Nevertheless the collection rate drops off the farther away from the trough and spray nozzle, especially past the center vent. The type of vent installation is undergoing further investigation.

Volume of Water and Air in Saturator Towers and Entrance and Exit Temperatures from the Towers.

Tower temperatures are currently usually between 100 and 110F for 5 and 20 per cent salt spray, and between 130 and 135F for acetic acid salt spray. In order to introduce sufficient water vapor into the air at 15 psi air pressure to yield the 84 per cent humidity for 20 per cent salt spray and 95–98 per cent humidity for 5 per cent salt spray, it is necessary to preheat the compressed air before use. This is accomplished in the water towers. These towers may be heated by their own heaters where cabinets are not within conditioned rooms. In conditioned rooms it is often advisable to run the tower heaters as added assurance of keeping the chamber humidity at the required level. The chamber and controls shown (Fig. 5) are within the conditioned room shown in Figure 2. When used for acetic acid salt spray the heaters for the chamber and tower are both turned on to achieve the desired 120F chamber and 130–135F tower temperatures. Figure 5 also shows a float valve arrangement that controls the volume of water in the tower.

Type and Grade of Salt Used

Salt of C.P. grade is desirable for salt spray use. We use this salt but it is expensive. "Flake or Dairy Salt" may be used. However, it should contain 99.8 per cent NACL and less than 0.1 per cent NAI and no copper or free chlorides. Salt solutions are usually made up in jugs and poured into the troughs by hand when needed. Some laboratories filter out impurities before using the salt solution from these jugs. Others just decant the solution into the trough.

A few years ago we installed a salt solution mixing tank. This gravity feeds all six of our chambers with the necessary solution. Gravity feed is used with a control valve at each chamber and at the mixing tank itself. This tank has a heating jacket and holds over 50 gallons of solution.

It is generally conceded that a 20 per cent salt solution is the maximum that can be used with success. A 20 per cent solution is sometimes more severe on a few materials, such as zinc coatings,[26] but often there is heavy initial build-up of salt deposits on the specimen which causes erratic, non-reproduceable results. It has been found by many investigators that with solutions above 10 per cent there is a tendency to produce reverse reaction of galvanic action.[28] Investigators have tested solutions from 3 to 10 per cent and some have agreed that 3 per cent is optimum.[9,32,39] Other investigators, reporting through ASTM, have adopted 5 per cent as optimum since it produces a 95–98 per cent RH and it is much easier to control.[49] Since 5 per cent salt spray produces similar results to that of 20 per cent spray, often in less time, there is little reason to use the difficult and usually non-correlatable 20 per cent spray. The U. S. government has recently revised its specifications and Federal Test Method Standard No 151, dated 17 July 1956, calls for use of 5 per cent salt spray in Method 811.[27]

The evaluation of salt spray equipment and its correlation with outdoor service depends most of all on the proper selection and standardization of specimens. There is every likelihood that the use of different types of specimens would produce different results. The Frankford Arsenal Corrosion Research Laboratory (a basic electrochemistry group) has recommended 1020 steel, cadmium plated steel and anodized magnesium panels. Corrosivity rates will be based on weight loss for steel and cadmium plated steel and upon visual observation of corrosion pits and growth on anodized magnesium.

Recently, three studies have been made of outdoor corrosion

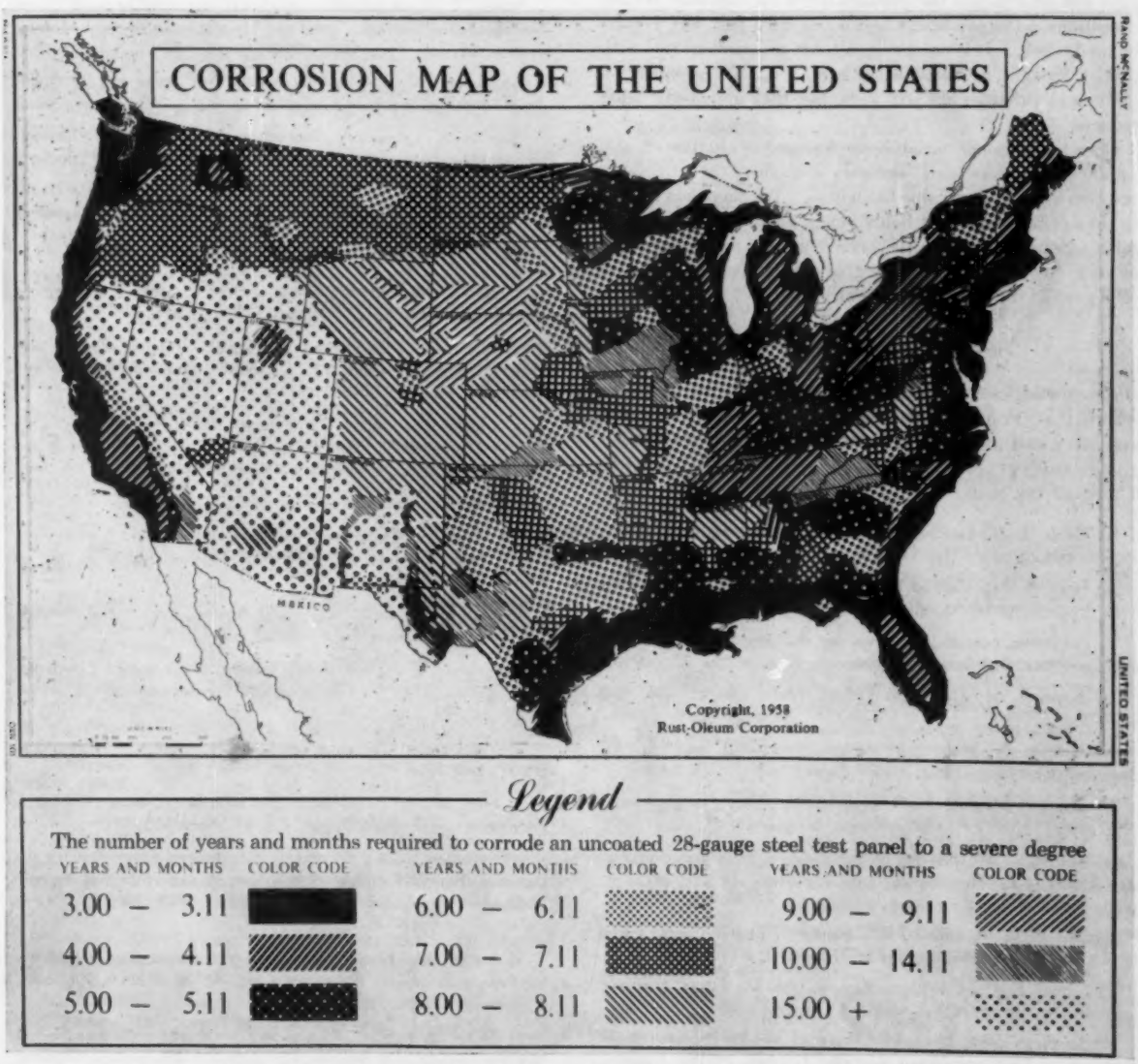

Fig. 6. Corrosion Map of the United States. Reproduced Courtesy of Rust-Oleum Corp.

of selected materials. Two were reported on in June 1959 at the Detroit Golden Jubilee of the AES.[33,34] The third is a corrosion map of the U.S. (Fig. 6) based upon exposures of identical panels of 1020 steel in 527 different cities by the Rúst-Oléum Corporation. The various colors represent the number of years of exposure necessary to reach the corrosive end point on the panels. Note that the seacoast areas are the most severe and the desert areas the least.

Data given in publications of the Quartermaster Research and Development Center at Natick, Mass., and data which Wright Field is collecting at air fields around the world[35] will provide information on weather conditions throughout the globe.

It should not be too difficult, once laboratory data is available through indoor exposures of standard panels, to select suitable areas of the globe for outdoor correlation studies. Smilar panels exposed at outdoor sites, with proper interpretation of past weather data, may give the long awaited service-life data the plating industry strives for.

What is needed most of all is a quick, efficient, simple and sure test to evaluate the product finish for customer service conditions. The salt spray test is one such test, but it must be used wisely. It is not a cure-all, but an excellent tool with proper thought and evaluation behind it. Its specification limits and variables are still wide, but they are slowly being reduced.

Once the chamber variables are lessened or eliminated, and significant outdoor data becomes available, the salt spray test will be of greater value to all of us. We may then be able to predict in a few short hours how a material for which the salt spray test is suitable, will behave under a service exposure of many years. This ultimate goal does not appear to be far off if present research activity is any criteria.

ACKNOWLEDGMENTS

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THE PREPARATION AND PROPERTIES OF IRON-NICKEL FILMS

by IGNATIUS TSU*

A chloride bath is described for the preparation of iron-rich films by electrodeposition. These films are isotropic, as indicated by measurements of 60-cycle B-H loops. This behavior is similar to that of the nickel-rich films described in the literature. However, the wall motion coercive force (H_c) is lower for the iron-rich films than it is for the nickel-rich films due to the relative magnetic properties of iron and nickel. The evidence presented shows that the anisotropic character of iron-nickel films does not depend solely on film composition. The addition of thiourea to the chloride bath causes extreme changes in the composition and physical properties of the plated films. The effects of adding 0.2 g/l of thiourea are reported.

GENERAL

FERROMAGNETIC FILMS can be prepared by electroplating techniques. The structural properties of the plated films depend on the film composition and the plating conditions. Most of the work reported in the past has been based on films plated from the well-known Wolf's bath.[1] This bath contains iron and nickel sulfate plus addition agents as described in the literature. Hysteresis loops of films containing 50 to 80 per cent nickel exhibit marked uniaxial anisotropy. Films plated from this bath with composition above 80 per cent nickel are not as well oriented and have high coercive forces. These magnetic properties are also observed in comparable evaporated films.[2] In view of the dependence of the magnetic properties on film composition in the range of 50–80 per cent nickel, there is interest in extending the investigation to films containing less than 50 per cent nickel (i.e., iron-rich films). The results of such an investigation are presented below.

EXPERIMENTAL

In these experiments the iron-rich films were first plated from Wolf's bath with a high concentration of iron salts. With the increase in iron sulfate, it was found that precipitation occurred in the bath. Even when the bath *p*H was reduced to a value of 1.0, a considerable amount of iron hydroxide precipitate was observed. The iron-nickel ratio of films plated from such baths was difficult to control. Furthermore, the coercive forces were very high and the magnetic properties generally poor. Therefore, the Wolf bath was abandoned and a plating bath containing chloride salts of iron and nickel and a supporting electrolyte was developed. This chloride bath is of special interest since the nickel chloride will have less polarization in nickel plating than nickel sulfate, which results in higher current efficiency.[3] The supporting electrolyte suitable for this bath may be calcium chloride, magnesium chloride, or manganese chloride. A typical chloride bath composition is:

$FeCl_2 \cdot 4H_2O$	300 g/l
$NiCl_2 \cdot 6H_2O$	40 g/l
$CaCl_2$ (Supporting Electrolyte)	180 g/l
HCl to control bath *p*H	

With an Fe^{++}/Ni^{++} ratio of 8.5 in the plating bath, a film of 92 per cent iron and 8 per cent nickel may be obtained under the following conditions:

*p*H = 0.9–1.5
current density = 3.5 amp/dm²
temperature = 65–90C.

A thickness of 3000 Å may be obtained in 0.8 minutes plating time. These are the optimum conditions for providing very iron-rich films with low coercive forces and very square hysteresis loops.

Addition agents exert an extremely pronounced influence on the structural and magnetic properties of these films. For example, the addition of 0.2 g/l of thiourea to the plating bath will produce a film of 5 per cent iron and 95 per cent nickel even though the plating conditions are exactly the same as those used in plating the iron-rich films.

Glass microscope slides were used as substrates in all of the experiments. These slides were made conductive by an evaporated nickel film about 300 Å thick. The substrate area was about 1.6 square cm.

DISCUSSION OF MAGNETIC PROPERTIES

Measurements of wall motion coercive force, H_c, versus nickel content for a film thickness of 3000 Å are presented in Fig. 1. Note that H_c decreases as the nickel content increases from zero. The hysteresis loops for compositions below 10 per cent nickel are isotropic. The squareness ratio of the B-H loop is about 0.90 for all orientations of the drive field applied in the plane of the film. The value of H_c remains practically constant in the film thickness range of 1200 to 3000 Å. In these two important respects, the magnetic behavior of these iron-rich films is similar to that of the nickel-rich films reported in the literature.[2]

Although the iron-rich films are "nominally isotropic", an anisotropy can be imposed in any direction by momentarily applying a magnetic field greater than H_c in that direction. With the application of such a field minor B-H loops may be observed whose shapes vary in direction with respect to the initial magnetizing field. This effect is illustrated in Fig. 2. The top B-H loop in Fig. 2 was recorded with the drive field

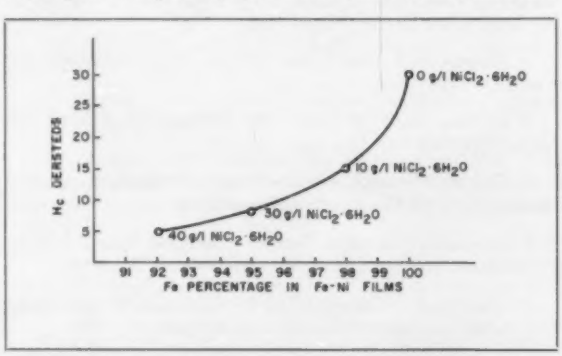

Fig. 1. Influence of film composition on wall motion coercive force (Film thickness constant at 3000 Å).

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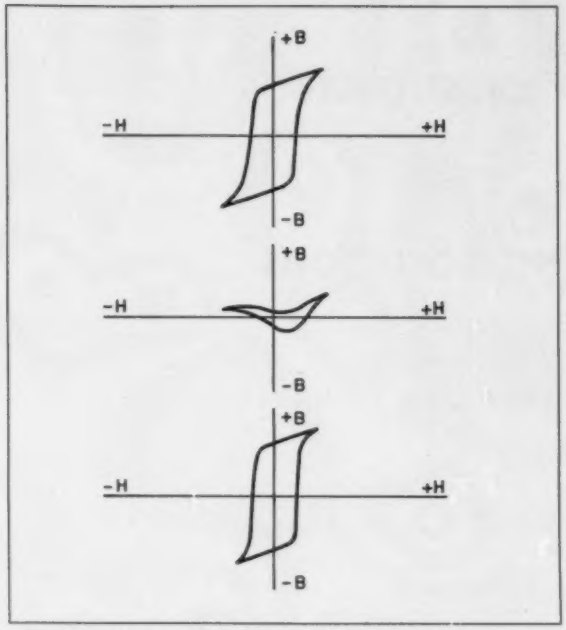

Fig. 2. Anisotropy imposed by applying a magnetic field greater than H_c in any direction.

parallel to the direction of the initial saturating field. The center B-H loop in the figure was recorded after the film had been rotated 90 degrees (i.e., the drive field was perpendicular to the initial saturating field). The bottom B-H loop in Fig. 2 was recorded with the film in this new position after a saturating field had been temporarily applied in this direction to reset the anisotropy axis.

The above observations indicate that the magnetic properties of the iron-rich films are influenced by involved domain configurations as suggested by Huber and Smith[2] for nickel-rich films. Kriessman, Belson, and Edelman[4] have reported similar magnetic behavior for thin films in the composition range of permalloy prepared by vapor deposition methods. Such magnetic behavior suggests that in iron-rich films H_k (uniaxial anisotropy) = 0 and that the field necessary to remagnetize the film is equal to the intrinsic coercive force.*

* The field necessary to remagnetize the film in the absence of any anisotropy is called the intrinsic coercive force H_i.

TABLE I

THIOUREA	0 g/l	0.2 g/l
Fe and Ni percentage	92% Fe and 8% Ni	5% Fe and 95% Ni
Crystal structure	Body-centered cubic	Face-centered cubic
Crystallite size*	250Å	1100Å
Strain $\Delta 1/1$* (rms)	4×10^{-3}	1.6×10^{-3}
Crystal orientation*	100 normal to the plane	111 normal to plane
Magnetic anisotropy	Isotropic	Anisotropic
Squareness, Br/Bm	0.95	0.88
Wall motion coercive force	5.0 oersteds	0.5 oersted

* These properties were measured by using techniques developed by R. S. Smith of this laboratory reported in the IBM Journal, **4**, No. 2, 205 (1960).

The addition of thiourea to the plating bath not only influences the film's alloy composition but also its structural properties. Table I illustrates the changes that are produced by adding 0.2 g/l of thiourea.

The relatively large crystal size of nickel-rich films plated with 0.2 g/l thiourea is consistent with reports[5] that the crystal size of films plated from Wolf's bath increases with nickel content. This suggests that the structural properties (such as phase and crystal size) of iron-nickel films are determined by the iron/nickel ratio. Therefore, it appears that the effect of thiourea is simply to alter the relative deposition rates of iron and nickel and structureal properties are determined by this ratio. However, the magnetic properties of the films cannot be explained on the basis of composition alone. The coercive forces, H_c, of 95 per cent Ni films plated from this chloride bath are less than one oersted, whereas H_c of 90 per cent Ni films plated from Wolf's bath range from 20 to 60 oersteds. Furthermore, the hysteresis loops of nickel-rich films plated from the chloride bath show a high degree of anisotropy as compared to the hysteresis loops of nickel-rich films plated from the Wolf's bath.

SUMMARY

A plating bath has been described from which iron-rich Fe-Ni films having low coercive forces can be deposited. These iron-rich films become more anisotropic as the nickel content increases. It has been shown that the nickel content of films plated from a given bath can range from a few per cent to 95 per cent due to the addition of a trace (0.2 g/l) of thiourea. The magnetic properties of the nickel-rich films (95 per cent) from the chloride bath differ from those plated from Wolf's bath. The former films showed a high degree of anisotropy and low H_c as compared to the high H_c and negligible anisotropy observed in 95 per cent nickel films plated from Wolf's bath. These studies demonstrate that the anisotropy of the Fe-Ni films does not depend entirely on the alloy composition of the films.

ACKNOWLEDGEMENT

The author would like to acknowledge the encouragement and assistance given by Drs. R. S. Smith, L. E. Godycki and R. D. DeMars. The technical assistance of N. J. Ziolkowski is also gratefully acknowledged.

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DETERMINATION OF SULFATE IN CHROMIUM PLATING SOLUTIONS

by GLORIA J. McKINLEY and ANNE QUINLAN JONES*

An evolution method for the determination of sulfate in chromium plating solutions is described. Sulfate is reduced to sulfide with hydriodic acid "reducing mixture". Liberated hydrogen sulfide is trapped in ammoniacal zinc sulfate solution. A standard potassium iodate-iodide solution is used to titrate resultant hydrogen sulfide. The method is precise and has an accuracy of ±1 per cent. Time required for a sulfate determination is one and one-half hours.

THE SHORTCOMINGS of the barium sulfate gravimetric method for the determination of sulfate in chromium plating solutions have been thoroughly analyzed and discussed by Keattch.[1]

Many attempts have been made to modify this method in order to obtain more accurate and precise results in less time but with little success. Other methods suggested for sulfate determination such as nephelometric,[2] centrifugal,[3] dead stop titration,[4] and the plating test for chromic acid: sulfuric acid ratio[5] fall far short of the accuracy required for close control of the chromic acid to sulfate ratio.

A new method for sulfate determination in chromium plating solutions has been described by Keattch.[1] This approach utilizes the work of Luke[6,7,8] who used a mixture of hydriodic, hyphophosphorus and hydrochloric acids to quantitatively reduce sulfate to sulfide in the analysis of metals, alloys and rubber.

Keattch[1] found that the sulfate in a sample of chromium plating solution could be quantitatively reduced to sulfide using this acid mixture. Quantities of iron, copper and fluosilicate up to five grams per liter did not interfere.

In using the procedure described by Keattch[1] it was found that the glass apparatus required was expensive and cumbersome. The necessity for evacuating the apparatus was time-consuming. Also certain errors in the method tended to cause consistently low results. Because of these considerations, the method was modified in the manner described in this paper.

In the method presented here the acid reducing mixture reduces the sulfate in a plating bath sample to sulfide. The liberated hydrogen sulfide is trapped in an ammoniacal zinc sulfate solution. After completion of the sulfate reduction, the resultant hydrogen sulfide is titrated with a standard potassium iodate-iodide solution.

This method is rapid and precise with an accuracy of ±1

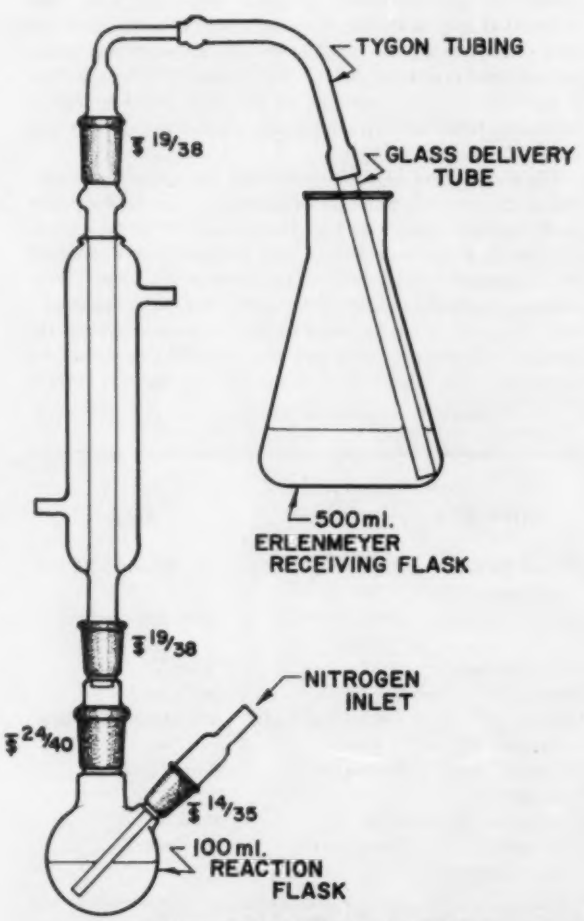

Fig. 1. Apparatus for determination of sulfate.

* Analytical Control Group, Van der Horst Corporation, Olean, N. Y.

per cent over the range tested. The tested range covers concentrations of sulfate found in conventional sulfate catalyst chromium plating solutions.

Apparatus: The distillation apparatus used is shown in Fig. 1. A 110-v Glas-Col heating mantle to fit the 100-ml flask is used as a heat source.

REAGENTS AND SOLUTIONS

Hydriodic Acid "Reducing Mixture":—Reflux for one hour (using a water condenser) a mixture of 200 ml of hydriodic acid (sp. gr. 1.5–1.7), 200 ml of hydrochloric acid (sp. gr. 1.18), 50 ml of hypophosphorus acid (50 per cent purified). High purity, dry nitrogen is bubbled through the mixture for the entire refluxing period. Refluxing should be carried out under a hood. Final solution is colorless or pale yellow.

Reducing mixture should be stored in a brown glass bottle and kept in a refrigerator.

Standard Potassium Iodate-Iodide Solution:—Dissolve 0.7134 grams of reagent grade potassium iodate in a solution of 8.0 grams of potassium iodide in 50 ml of water. Dilute to one liter in a volumetric flask.

Ammoniacal Zinc Sulfate Solution:—Dissolve 50 grams of zinc sulfate, heptahydrate, reagent grade, in 250 ml of water in a 500-ml borosilicate glass flask. Add 250 ml concentrated NH_4OH and mix. Stopper and allow to stand overnight. Filter, if necessary, into a 500-ml borosilicate flask. Keep bottle stoppered at all times when not in use to prevent loss of ammonia.

Starch Solution:—To 4.5 grams of soluble starch add 5–10 ml of water and stir until a smooth paste is obtained. Pour mixture slowly into 250 ml boiling water. Cool, add 7.5 grams of potassium iodide and stir until iodide is dissolved. Dilute to 500 ml. This solution is not stable and should be prepared as needed. If stored in a refrigerator, it will be satisfactory for a week or two.

Nitrogen:—High purity, dry nitrogen.

Procedure:—(1) To 30 ml of hydriodic acid mixture in the 100-ml flask (Fig. 1) add 5 ml of plating solution by pipette. While adding sample allow high purity, dry nitrogen to pass at a slow rate through the reducing mixture. Use a slow rate of sample addition to prevent excessive evolution of iodine.

(2) After sample addition, allow all iodine fumes to be flushed from flask by nitrogen. Test for completeness of flushing using potassium iodide-starch test paper. Time for complete flushing is usually 5–15 minutes.

(3) Add 150 ml of water and 10 ml of ammoniacal zinc sulfate solution to the 500-ml receiving flask.

(4) Assemble apparatus completely. Adjust nitrogen flow rate to 2–3 bubbles per second. Reflex contents of flask for one hour.

(5) At end of one hour remove receiving flask. Allow glass delivery tube to remain in flask during titration.

(6) Add 3 ml of starch solution and 40 ml of hydrochloric acid (1:1) to flask. Titrate immediately with standard potassium iodate-iodide solution. During the titration a pink color is generally produced in the solution but this color should be ignored and titration continued until a permanent blue or purple color is obtained. A magnetic stirrer is conveniently used for mixing during titration. The bulk of the titrant should be added as rapidly as possible until blue starch-iodine color shows signs of persisting. Titration is then continued dropwise until permanent blue color appears in solution.

Calculation: (ml standard KIO_3-KI solution) (9.60×10^{-4}) (200) = grams per liter $SO_4^{=}$.

RESULTS AND DISCUSSION

The validity of the method was tested using standard solutions of pure, dried potassium sulfate. The accuracy and precision obtained with the standard solutions are shown in Table I.

To avoid the problem of high blanks caused by sulfate present in reagent grade chromium trioxide, an amount of hexavalent chromium equivalent to that contained in a 5-ml portion of a 250 g/l chromic acid solution was added to each standard sulfate sample as dry potassium dichromate, NBS oxidimetric standard.

Sulfate content of the NBS potassium dichromate was determined and the consistently low value of 0.05 ml of standard potassium iodate-iodide solution per 1.8380 grams of potassium dichromate was subtracted from all titration results. The blank on the other reagents was less than 0.05 ml of standard iodate-iodide solution. This blank was considered negligible.

Time of refluxing was found to be important. A reflux period of 30 minutes gave low results. Reflux periods greater than one hour but less than two hours did not influence the titer.

Temperature of solution during refluxing was maintained

TABLE I

ACCURACY AND PRECISION OBTAINED WITH RECOMMENDED PROCEDURE

SULFATE, g/l			
Taken	Found	Average	Standard Deviation
2.00	2.02, 2.00, 1.99, 2.00 2.02, 2.01	2.01	.01
2.50	2.49, 2.51, 2.49, 2.50, 2.51, 2.49, 2.51	2.50	.01
3.00	2.97, 3.00, 2.98, 2.97, 3.00, 2.97	2.98	.01

TABLE II

RESULTS OF ANALYSES OF CHROMIUM PLATING SOLUTIONS BY EVOLUTION METHOD

Tank	Volume Liters	Fe^{+3} g/l	Cr^{+3} g/l	Sulfate g/l		
				Original	Nominal	Adjusted
A	114	2.4	1.6	2.32	2.50	2.50
B	5,432	8.0	6.2	2.43	2.50	2.50
C	5,617	8.0	6.5	2.38	2.50	2.50
D	16,064	4.2	5.4	2.45	2.50	2.50
E	114	0.3	4.4	1.61	2.21	2.22

in the range 100–110C. Temperatures less than 100C caused results to be low.

A nitrogen flow rate of 2–3 bubbles per second is adequate for good results. Higher flow rates are not necessary for quantitative recoveries but lower flow rates tend to give low results.

Effect of the major contaminants of industrial chromium plating solutions, i.e., iron and trivalent chromium, was also investigated. Iron concentrations to 8 grams per liter and trivalent chromium concentrations to 8 grams per liter in the same solution did not influence the results.

Sulfate may be determined with precision and accuracy in chromium plating solutions containing 400 g/l chromic acid and 4.00 g/l sulfate by a suitable dilution of the sample. In this case, the sample aliquot should be 5 ml per 30 ml of reducing mixture.[1] Sulfate concentrations of less than 2.00 grams per liter may be determined directly by this method but the average accuracy is ±2 per cent, probably because of the small titer.

From Keattch's[1] results, it appears that this method would also be valid for sulfate determination in mixed catalyst chromium plating solutions containing both fluosilicate and sulfate.

Results from the analysis of actual chromium plating solutions by this method are shown in Table II. The analysis of the corrected solution was made very soon after it was known that mixing of the plating bath after the sulfuric acid addition would form a homogeneous solution.

CONCLUSIONS

The results indicate that this method provides the accuracy and precision necessary for close control of sulfate concentration in conventional sulfate catalyst chromium plating solution. A sulfate determination may now be completed in less than one and one-half hours. Major contaminants of industrial chromium plating solutions such as trivalent chromium and iron do not interfere.

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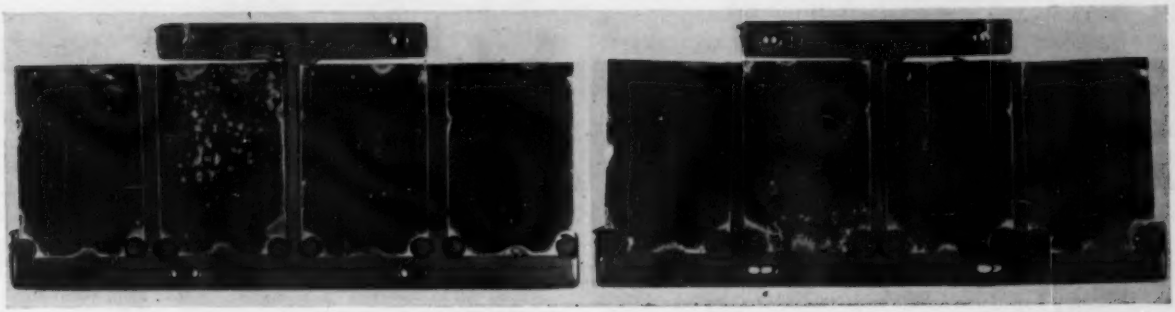

Fig. 1. Panel rack—One winter in Detroit.

Fig. 1a. Panel rack—One winter in Chicago.

CORRELATION OF OUTDOOR EXPOSURE, SERVICE AND ACCELERATED TESTS ON CHROMIUM PLATED BRIGHT WORK

by R. B. SALTONSTALL† and D. R. MILLAGE‡

INTRODUCTION

WIDE VARIATIONS IN SERVICE PERFORMANCE of plated decorative and functional trim commonly used in the automotive industry have caused in recent years increasing concern on the part of manufacturers, platers, suppliers of plating processes, and the users of automobiles. Certain bright nickel-chromium plated steel parts which are in excellent condition after having been in service in the Detroit area for ten years are positive proof that good performance can be obtained. Observation of plated steel parts in service which show masses of red rust only in areas where the plate is thinnest, point out one important cause of failure—insufficient plate thickness. This is further confirmed by the fact that in the past, thickness requirements for copper-nickel-chromium deposits on zinc have been considerably lower than on steel, and plated zinc base die castings have correspondingly showed poorer general performance.

The increased use of de-icing salt during the winter months, coupled with the increased number of automobiles and furnaces whose exhausts are polluting the atmosphere with corrosive acids, have seemingly accelerated this corrosion. These factors, plus the trend toward designs which increasingly make good plate distribution more difficult, have produced a tremendous challenge to the plating industry.

The plating industry has necessarily accepted this challenge and never in its history has there been a more determined effort to understand the corrosion characteristics of plated decorative coatings and to improve their protective value. There have been many important papers[1] published in the last few years that outline ways of improving the protective value of plated decorative coatings. The new accelerated tests, Corrodkote and Copper Accelerated Acetic Acid Salt Spray (CASS) have been widely used as tools to study the corrosion characteristics of various plating systems, and their adoption as "acceptance tests" has made the automotive branch of the plating industry more corrosion conscious than ever before.

The published improvements in corrosion performance of plated decorative coatings have been based on the results of "static" corrosion test sites such as stationary exposure in an industrial atmosphere and at Kure Beach, and the accelerated tests. While it logically seems that there should be correlation between static exposure, mobile testing, and service life, the decided superiority of some plating systems in some static exposures and accelerated tests created doubts as to the real extent of this correlation. Accordingly, a preliminary controlled mobile test program was included in our corrosion program during the winter months of 1958–1959.

VARIABLES TESTED

Due to space limitations on mobile test sites and because this was a preliminary program, it was decided to compare only a few of the systems which had shown some improvement in basis metal protection in some or all of the static exposure tests, and accelerated tests.

Standard 4- by 6-inch panels were plated under carefully controlled laboratory conditions using normal plating procedures on a shielded plating rack that insured uniform plate distribution. It is a reasonable assumption that replicate panels in a series were as near alike as it is possible to make them. The panels plated were:

Steel

A) 1 mil bright nickel with 0.01 mil chromium*
B) 1 mil bright nickel with 0.03 mil HT-HR** chromium
C) 1 mil nickel (80 per cent sulfur free semi-bright, 20 per cent bright nickel)*** with 0.01 mil chromium
D) 0.4 mil copper—0.8 mil bright nickel with 0.03 mil HT-HR chromium

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NOTE—This paper was originally presented at the American Zinc Institute Plating Symposium, held at the Hotel Statler Hilton, Detroit, Michigan, on November 11 and 12, 1959.

*Conventional chromium, 110F, Ratio 100.
**High temperature (130F), High ratio (135 to 165).
***Hereafter referred to as composite nickel deposit.

Zinc Die Cast

E) 0.4 mil copper—0.8 mil bright nickel—0.01 mil chromium*

F) 0.4 mil copper—0.8 mil bright nickel—0.03 mil HT-HR** chromium

G) 0.4 mil copper—0.03 mil HT-HR chromium—0.8 mil bright nickel—0.03 mil HT-HR chromium**

H) 0.4 mil copper—0.8 mil nickel (80 per cent sulfur free semi-bright, 20 per cent bright nickel)***—0.01 mil chromium*

CORROSION TESTING AND RESULTS

A. Outdoor Exposure in an Industrial Atmosphere

The steel and zinc die cast panels listed above were boldly exposed on a roof in a Detroit industrial atmosphere, at a 30 degree angle, facing South, for one winter. During this period no attention was given the panels and the only washing was that attributable to rain or melting snow. Rating numbers for the steel and zinc die cast panels, determined by the weighted area method,[2, 3] are shown in Table I.

TABLE I

Steel Basis Metal—Detroit Roof Exposure—9 Months

	Deposit	Weighted Area Rating No.	Principal Defect
A	1.0 mil Bright Nickel—0.01 mil Chromium*	4.5	Pin Point Rust
B	1.0 mil Bright Nickel—0.03 mil Chromium**	6.0	Pin Point Rust
C	1.0 mil Nickel 80% Sulfur Free—20% Bright Nickel—0.01 mil Chromium*	5.5	Pin Point Rust
D	0.4 mil Copper—0.8 mil Bright Nickel—0.03 mil Chromium**	9.3	Surface Pitting Pin Point Rust
	Zinc Die Cast—Detroit Roof Exposure—9 Months		
E	0.4 mil Copper—0.8 mil Bright Nickel—0.01 mil Chromium*	4.5	Blisters Surface Pitting
F	0.4 mil Copper—0.8 mil Bright Nickel—0.03 mil Chromium**	7.7	Blisters
G	0.4 mil Copper—0.03 mil Chromium**—0.8 mil Bright Nickel—0.03 mil Chromium**	9.6	Surface Pitting
H	0.4 mil Copper—0.8 mil Nickel 80% sulfur free—20% Bright Nickel—0.01 mil Chromium*	6.2	Blisters Surface Pitting

*Conventional chromium, 110F, Ratio 100.
**High temperature (130F), High Ratio (135 to 165).

B. Accelerated Corrosion Tests

1. Corrodkote

Steel and zinc die cast panels were exposed to one 20-hour Corrodkote cycle. Details of this test have been published elsewhere[4, 5] and will not be dwelt upon here. The results of this test are shown in Table II.

2. Copper Accelerated Acetic Acid Salt Spray Test (CASS)

Steel and zinc die cast panels were exposed to one 24-hour CASS cycle. Details of this test have been published elsewhere[4, 6, 7] and will not be dwelt upon here. The results of this test are shown in Table III.

*Conventional chromium, 110F, Ratio 100.
**High temperature (130F), High ratio (135 to 165).
***Hereafter referred to as composite nickel deposite.

TABLE II

Steel Basis Metal—20 hour Corrodkote

	Deposit	Weighted Area Rating No.	Principal Defect
A	1.0 mil Bright Nickel—0.01 mil Chromium*	6.0	Pin Point Rust
B	1.0 mil Bright Nickel—0.03 mil Chromium**	8.0	Pin Point Rust
C	1.0 mil Nickel 80% Sulfur Free—20% Bright Nickel—0.01 mil Chromium*	9.0	Surface Pitting
D	0.4 mil Copper—0.8 mil Bright Nickel—0.03 mil Chromium**	9.4	Pin Point Rust
	Zinc Die Cast—20 hour Corrodkote		
E	0.4 mil Copper—0.8 mil Bright Nickel—0.01 mil Chromium*	5.2	Blisters Small Craters
F	0.4 mil Copper—0.8 mil Bright Nickel—0.03 mil Chromium**	6.7	Small Craters
G	0.4 mil Copper—0.03 mil Chromium**—0.8 mil Bright Nickel—0.03 mil Chromium**	9.5	Surface Pitting
H	0.4 mil Copper—0.8 mil Nickel 80% Sulfur Free—20% Bright Nickel—0.01 mil Chromium*	9.3	Surface Pitting

*Conventional chromium, 110F, Ratio 100.
**High temperature (130F), High Ratio (135 to 165).

TABLE III

Steel Basis Metal—24 hours CASS

	Deposit	Weighted Area Rating No.	Principal Defect
A	1.0 mil Bright Nickel—0.01 mil Chromium*	5	Pin Point Rust
B	1.0 mil Bright Nickel—0.03 mil Chromium**	7	Pin Point Rust
C	1.0 mil Nickel 80% Sulfur Free—20% Bright Nickel—0.01 mil Chromium*	9.5	Surface Pitting
D	0.4 mil Copper—0.8 mil Bright Nickel—0.03 mil Chromium**	6	Pin Point Rust
	Zinc Die Cast—24 hours CASS		
E	0.4 mil Copper—0.8 mil Bright Nickel—0.01 mil Chromium*	4	Blisters Small Craters
F	0.4 mil Copper—0.8 mil Bright Nickel—0.03 mil Chromium**	6	Blisters
G	0.4 mil Copper—0.03 mil Chromium**—0.8 mil Bright Nickel—0.03 mil Chromium**	9.5	Surface Pitting
H	0.4 mil Copper—0.8 mil Nickel 80% Sulfur Free—20% Bright Nickel—0.01 mil Chromium*	9.5	Surface Pitting

*Conventional chromium, 110F, Ratio 100.
**High temperature (130F), High Ratio (135 to 165).

C. Mobile or Service Life Tests

In any evaluation or comparison of corrosion superiority of one plating system over another plating system in mobile testing or service life, there are several important factors to consider. Have the parts being evaluated been exposed to the same corrosive atmosphere for the same period of time and have all of the plating variables been under rigid control? In any survey of plated parts on automobiles, one does not know how long the car has been on the road, or how many winters it has been through, or the extent of care it has received. Therefore, it becomes necessary to examine a large number of automobiles and attempt to arrive at a statistical meaning. Too, because generally speaking, no one part is plated in different systems, a comparison of different parts is necessary which generally means that important factors which influence service life, such as plate thickness and distribution, may vary considerably. Also the vagaries of production plating are such that wide variations are possible from part to part.

In our program with the plating procedures under rigid control and because the panels from the different systems under test were mounted close together on the front bumper of the same car, they were exposed for the same time under identical conditions. They also received the same care and washings. Under these conditions, even with relatively few cars, any difference in corrosion resistance from one system to another should be meaningful.

Racks containing the panels under test were exposed on cars in Detroit, Chicago, Cleveland, New York City, Pittsburgh and Syracuse, N. Y. areas during the winter months of 1958–1959. In all of the areas, with the exception of New York City, the winter was very severe. During the 1958–1959 winter in Detroit, a continuous icy condition existed for 6 weeks during which time the streets were salted every day. During a winter which may be classified as "light", the streets are only salted about 20 times. No special attention was given to the panels and they were washed on an average of 2 times a month during the exposure period. Typical racks holding steel panels after one winter's exposure in Detroit and Chicago are shown in Figs. 1 and 1a respectively.

As could be expected, the degree of corrosion varied appreciably from car to car and from area to area again pointing out the difference in local corrosion conditions and driver care. Table IV shows the rating for one set of steel panels exposed in the Detroit area, one set in the Chicago area, and also lists the minimum, maximum and average ratings for all of the steel panels exposed on all cars in all areas.

We have not tabulated the results of mobile tests after one winter's exposure for the plated zinc base die castings. Very few of the panels had any sign of basis metal corrosion, which further emphasizes the importance of adequate minimum thickness of nickel. The few corrosion spots which did appear were mostly confined to Panels F plated with 0.4 mil copper, 0.8 mil bright nickel and 0.03 mil HT-HR chromium. Judging from the backs of some of the panels, where apparently corrosion was more severe, it appeared that the deposits on Panels G, plated with copper, chromium, nickel and chromium, might be outstanding in providing basis metal protection.

A good many of the panels did have small nicks and depressions, which apparently stemmed from road gravel or similar objects hitting the panels.

Most of the panel racks, both steel and zinc die cast, have been returned to the original car and area for another winter's exposure.

DISCUSSION

A. Outdoor Roof Exposure in an Industrial Atmosphere

The results after exposure for one winter in an industrial atmosphere are clear, follow the previously established trend, and agree fairly well with the results published by others.

Generally on our roof, after exposure for one winter, copper-bright nickel deposits on steel, in which the nickel thickness exceeds 0.5 mil and the copper constitutes an appreciable portion of the deposit, will receive a higher rating number than equal thicknesses of bright nickel. After exposure for two winters, the reverse is true; copper-nickel deposits will develop blisters and crater-rusting which down grade the specimen.

At the end of one winter on the roof, composite nickel deposits composed of 80 per cent sulfur free semi-bright nickel and 20 per cent fully bright nickel, will usually have a rating number about one unit higher than an equal thickness of fully bright nickel. At the end of roof exposure for two winters, these deposits provide essentially the same degree of corrosion protection. On these composite deposits exposed on our roof, the lateral corrosion of the bright nickel portion which is so pronounced in the accelerated tests, is either nonexistent, or present only to a slight extent.

An increase in HT-HR chrome thickness from 0.01 to 0.03 mil will generally increase the rating number about three units in an industrial roof exposure.

B. Accelerated Corrosion Tests

1. Corrodkote

The results of one 20-hour Corrodkote cycle are consistent

TABLE IV

STEEL BASIS METAL—ONE WINTER MOBILE EXPOSURE

Deposit	Weighted Area Rating Numbers					Average no. of Rust Spots
	Detroit	Chicago	Minimum of all	Maximum of all	Average of all	
A 1.0 mil Bright Nickel—0.01 mil Chromium*	8.4	9.1	6.0	9.1	8.2	7
B 1.0 mil Bright Nickel—0.03 mil Chromium**	3.9	5.2	3.2	7.8	5.3	98
C 1.0 mil Nickel 80% sulfur free—20% Bright Nickel—0.1 mil Chromium*	8.4	9.0	6.7	9.0	8.4	7
D 0.4 mil Copper—0.8 mil Bright Nickel—0.03 mil Chromium**	8.8	9.4	6.4	10.0	8.7	9

*Conventional chromium, 110F, Ratio 100.
**High temperature (130F), High Ratio (135 to 165).

Fig. 2. Corrosion pit in composite nickel after one Corrodkote cycle (Original magnification X 250).

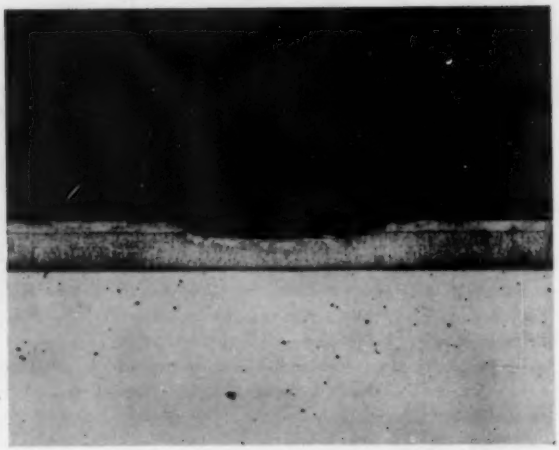

Fig. 3. Corrosion pit in composite nickel after two Corrodkote cycles (Original magnification X 250).

with the results of hundreds of Corrodkote tests conducted in our laboratory.

Like the roof exposure, an increase of chromium thickness from 0.01 to 0.03 mil will generally increase the rating by 2 to 3 units.

Copper as an undercoat to bright nickel deposits on steel is always beneficial in Corrodkote testing. The degree of benefit that copper provides is a variable that at this time is not completely understood. This inconsistency is about the only one that we have encountered in Corrodkote testing.

In Corrodkote testing there is no doubt about the decided superiority of the composite nickel deposits in comparison with bright nickel deposits. Bright nickel deposits, 1.0, 1.5 or 2.0 mil, even as high as 3.5 mil thick, with 0.01 mil of chromium, will usually show some sign of basis metal attack. On the other hand, it is not uncommon for a 1.0 mil composite nickel deposit, with 0.01 mil of chromium, to be submitted to two 20-hour cycles of Corrodkote with no basis metal attack. The composite nickel deposits at the end of one 20-hour Corrodkote cycle will have a high population of surface pits that extend through the bright nickel and slightly into the sulfur free nickel. Figure 2 is a cross-section of a representative surface pit after one Corrodkote cycle. At the end of two 20-hour Corrodkote cycles, both the number and size of the surface pits have increased. Figure 3 is a cross-section of a representative pit at the end of two 20-hour Corrodkote cycles. It is readily apparent that appreciable corrosion has taken place laterally in the bright nickel, while penetration into the sulfur free deposit has increased only slightly.

The zinc die cast panels also followed an expected trend. A thickness of 0.03 mil of chrome resulted in higher ratings than 0.01 mil. Composite nickel deposits on die castings, as on the steel panels, show no basis metal corrosion or blisters, but are down graded slightly because of surface pitting. Copper-chrome-nickel-chrome panels generally do not show basis metal corrosion and the degree of surface pitting is dependent on the thickness of both the outer nickel and chrome deposits.

2. Accelerated Acetic Acid Salt Spray (CASS)

The results of one 24-hour cycle of CASS testing follow the same general trend established by Corrodkote and roof exposure with one major exception. Copper as an undercoating to bright nickel on steel does not seem to be beneficial and, more often than not, actually is detrimental in the CASS test.

An increase in HT-HR chromium thickness from 0.01 to 0.03 mil will generally increase the rating number by 2 or 3 units in this test.

Composite coatings of nickel are definitely far superior to an equal thickness of bright nickel in the CASS test. At the end of one 24-hour cycle in the CASS test, the surface of chromium plated composite coatings of nickel will have a fairly high population of surface pits, although not as high as in the Corrodkote test. These surface pits extend through the bright nickel and slightly into the layer of sulfur free nickel. A cross-section of a representative surface pit at the end of 24 hours of CASS testing is shown in Fig. 4. At the end of two 24-hour cycles of CASS testing, the surface pits will increase in size and number and there may be, in some cases, a few points of basis metal failure. A cross-section of a representative surface pit after two 24-hour cycles of CASS testing is shown in Fig. 5. Corrosion has extended laterally in the bright nickel and downward in the sulfur free nickel.

Fig. 4. Corrosion pit in composite nickel after 20 hours CASS Test (Original magnification X 250).

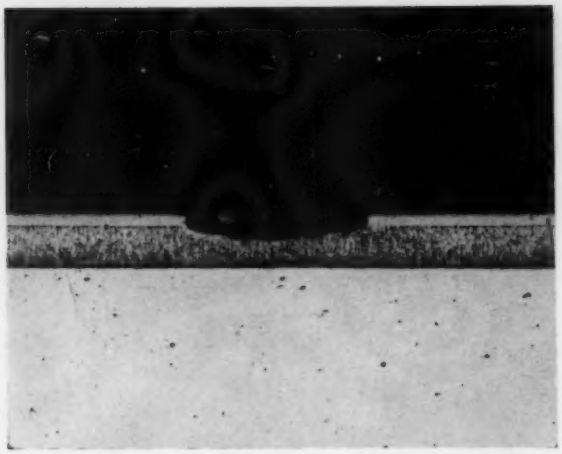

Fig 5 Corrosion pit in composite nickel after 40 hours CASS Test (Original magnification X 250).

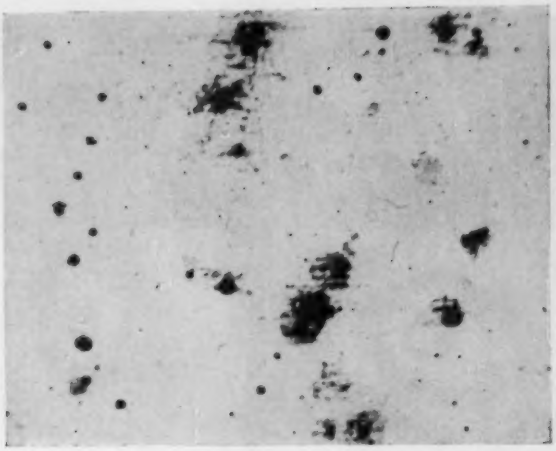

Fig. 7. 0.0046 mil chromium.

The downward penetration of the sulfur free nickel is much more rapid in the CASS test than in the Corrodkote test.

The zinc base die cast panels in the CASS test follow a pattern very similar to the Corrodkote test but, generally, blistering and crater corrosion are more pronounced.

When 0.03 mil of HT-HR chromium is deposited on a given copper-bright nickel deposit, the rating will be 2–3 units higher than with 0.01 mil of conventional chromium.

Composite coatings of sulfur free semi-bright and fully bright nickel over copper in the CASS test will develop surface pitting and even the lower thicknesses frequently applied to zinc die castings will usually withstand one 24-hour cycle of CASS testing with little or no basis metal corrosion.

Copper-chromium-bright nickel-chromium coatings on zinc die castings provide excellent basis metal protection in the CASS test. Surface pitting is generally the only defect after several 24-hour cycles of CASS testing. The distribution and size of the surface pits depends greatly on the thickness of the outer nickel and chromium layers.

One current specification[7] for CASS testing includes cleaning the part with a slurry of magnesium oxide. This has met with some criticism as possibly being too severe. It seems that this is a very necessary inclusion in the specification, as otherwise the test has little significance. For example, if magnesium oxide is not used to clean the panels, it is not unusual for 0.5 mil of bright nickel, plated with 0.01 mil of chromium, from an HT-HR solution, to have little or no failure after 24 hours in the CASS test; while 1.5 mil of bright nickel, chromium plated to the same thickness from a conventional solution, will have failed completely. This relationship would be completely reversed on roof exposure in an industrial atmosphere. Vigorous scrubbing of both panels with magnesium oxide paste prior to CASS testing would put them more nearly in the relationship exhibited on roof exposure. It is our experience that only in the CASS test, neutral salt spray test, and in the Kure Beach atmosphere that this tremendous difference exists in corrosion protection between different chromium deposits of the same thickness.

ASTM B 287-57T, "Tentative Method of Acetic Acid-Salt Spray (Fog) Testing", requires cleaning of the specimens prior to testing, and either magnesium oxide paste or a non-corrosive organic solvent which does not deposit a protective or corrosive film, may be used. This option, if permitted for cleaning prior to CASS testing, could cause serious differences in results because of the effects described in the preceding paragraph. In fact, it seems possible that variations in the

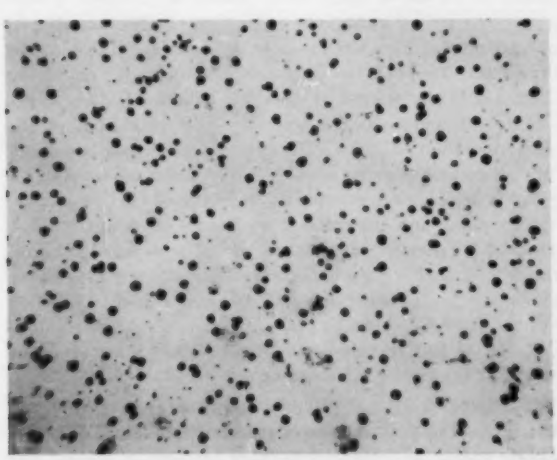

Fig 6. 0.0023 mil chromium.

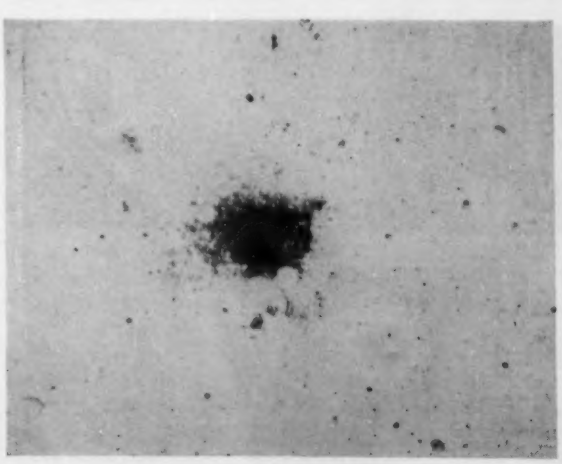

Fig. 8. 0.018 mil chromium.

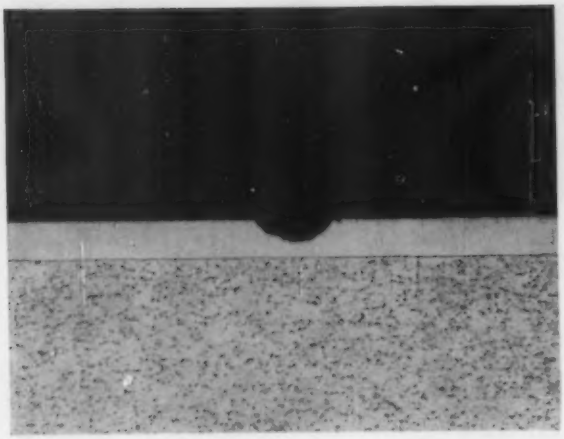

Fig. 9. 0.0023 mil chromium.

severity of scrubbing with magnesium oxide may partially account for difficulties sometimes encountered in obtaining reproducibility in CASS testing, especially when variations in types of chromium deposits are involved.

C. Mobile Testing (Service Exposure)

The results of exposure for one winter on mobile test sites, while not entirely conclusive, are in some instances contrary to results of other tests and exposure.

There was little doubt, at the end of one winter, that for the specific thicknesses of copper and bright nickel used, copper as an undercoat was beneficial. This factor may account for the fact that the zinc base die cast panels showed little or no basis metal corrosion. It is quite possible, indeed probable, judging again from the backs of the panels, that this result will be reversed after exposure for another winter.

At the present stage of corrosion, it is not possible to make any definitive statement regarding the relative protective value of the bright nickel versus the composite nickel deposit. They are so nearly alike on the mobile test sites that for all practical purposes they may be considered identical. Certainly the tremendous difference that exists in the accelerated tests was not evident. It is possible that differences will be more apparent at the end of another winter.

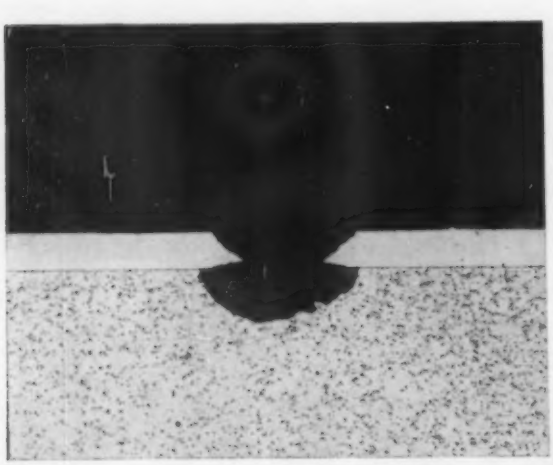

Fig. 10. 0.0046 mil chromium.

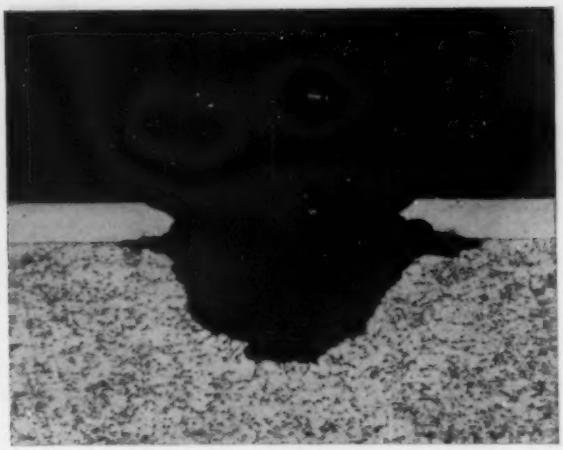

Fig. 11. 0.018 mil chromium.

There is no doubt that increasing the chromium thickness from 0.01 to 0.03 mil on 1 mil of bright nickel was decidedly harmful on the mobile test sites. This points out a factor that is often overlooked in corrosion testing, and particularly so in the accelerated corrosion testing, of decorative deposits. This factor, which is vital to service life, is the rate of penetration to the basis metal.

In atmospheres that are extremely corrosive, as in the accelerated tests where penetration of 1.0–1.5 mil of bright nickel is not uncommon in as little as four hours, or in static industrial roof exposures where penetration of 1.0–1.5 mil of nickel will occur in about one month during the winter, it is practically impossible to differentiate between the rates of penetration of equal thicknesses of nickel plated with 0.01 or 0.03 mil of chromium. Penetration through the nickel to the basis metal occurs quickly, and we are actually rating the porosity pattern of the chromium plate. Naturally, because 0.03 mil of chromium has fewer pores than 0.01 mil of chromium, the 0.03 mil deposit of chromium will receive a higher rating number. In order to demonstrate the effect of the porosity pattern of the chromium plate on the rate of penetration of nickel in highly corrosive atmospheres, it is necessary to decrease the chromium thickness to 0.005 mil or less. For example, Figs. 6, 7 and 8 show the porosity pattern, for a given area, obtained after two years industrial roof exposure of 1.5 mil of bright nickel plated with 0.0023, 0.0046 and 0.018 mil of chromium respectively. The number of pores per unit area decreases with increasing thickness of chromium; however, the pore size increases with increasing thickness of chromium. Figures 9, 10 and 11 show cross-sections of representative corrosion pits from each of the above mentioned panels. The rate of penetration through a given thickness of nickel is much slower where the total anode area (area of nickel exposed by porosity of the chromium) has increased and the cathode area (area of chromium) has decreased. Incidentally, at the end of one year exposure, the deposit with 0.0046 mil of chromium had not penetrated the nickel to the steel and had received a high protective rating. At the end of two years exposure, penetration to the basis metal had occurred and because the porosity pattern was high, it received a low rating.

It is quite likely that rate of penetration is responsible for this reversal of performance of thicker chromium deposits in mobile testing as compared to other methods of testing. It is quite possible, indeed probable, (again, judging from the

Fig. 12. Surface view of pits caused by dirt.

backs of the panels) that at the end of another winter's exposure these results will reverse themselves.

An interesting type of corrosion which seems worthy of mention was noticed on several of the car racks. This type of corrosion occurred on one rack of steel panels exposed in the Pittsburgh area and on one rack of zinc die cast panels exposed in the Chicago area. The same type of corrosion occurred on all four panels on each of the racks. In addition to the expected and conventional pin point corrosion, clustered corroding areas had developed into rather large surface pits of irregular shape and size. A surface view of some of these large surface pits is shown in Figs. 12 and 13. At first glance, it would seem that the corrosion was proceeding laterally in a manner somewhat reminiscent of the lateral corrosion seen in the composite nickel deposits in accelerated tests. A cross-section of one of these large surface pits is shown in Fig. 14. The corrosion barely extends below the chromium-nickel interface. It seems highly probable that dirt or some foreign object pressing tightly against the chromium excluded oxygen, thereby activating the chromium to the extent that, in the presence of a corrosive liquid, it was dissolved in that area.

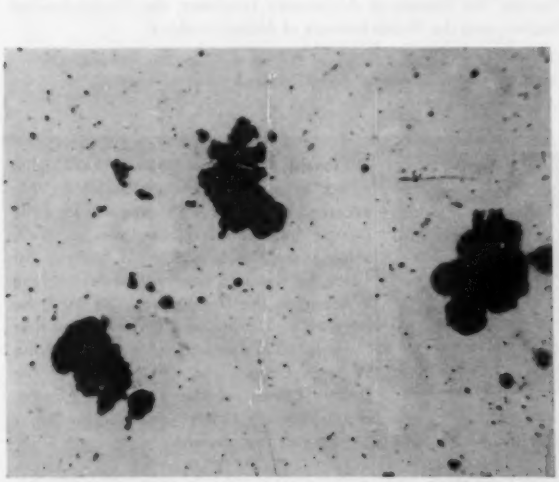

Fig. 13. Surface view of pits caused by dirt (Original magnification X 20).

Fig. 14. Cross section of pits caused by dirt (Original magnification X 1000).

CONCLUSIONS

Based on these somewhat limited preliminary efforts, the following conclusions appear to be justified from the data shown in Table V.

1. The CASS and Corrodkote, as well as static roof exposure, were all appreciably more severe on the 1.0 mil bright nickel plus 0.01 mil chromium than one winter on the mobile test sites.

2. Neither the CASS, Corrodkote, nor static roof exposure correctly predicted that the effect of 0.03 mil HT-HR chromium, compared with 0.01 mil conventional chromium on 1.0 mil bright nickel, at the end of one year service exposure would be harmful.

3. The marked superiority of the composite nickel coatings (80 per cent sulfur free—20 per cent bright nickel) compared with an equal thickness of bright nickel, which was apparent in the accelerated tests, was less apparent in our roof exposure. The mobile exposure results for both of these systems, however, showed very little deterioration in one winter exposure and longer mobile exposure tests are needed to determine comparative performance.

The unexpectedly good behavior of the bright nickel with 0.01 mil chromium plate on the mobile test sites tends to confirm an observation made previously, viz., that failure to specify adequate bright nickel thickness, and/or failure to enforce specifications has resulted in untimely failures.

The danger in translating or interpolating correlation between accelerated tests and service exposure from one coating system to another, or even within the same system when variables in types of coatings are introduced, has been pointed out many times. In spite of this, there is an understandable but highly undesirable tendency to specify the new accelerated tests for many coatings and materials without proper correlation. This practice should be discouraged to the greatest extent possible.

There may be some danger of being lulled into a sense of false security, if we predict the serviceability of plated articles entirely on the basis of the accelerated tests. The striking improvement in test results of thin bright nickel deposits resulting from the application of very thin chromium, particularly in the Corrodkote test, is a case in point. Relaxation of nickel thickness requirements based on results of accelerated tests on different coating systems without service correlation may be premature.

TABLE V

STEEL BASIS METAL

	Deposit	Roof	Corrodkote	CASS	Mobile (Det.)	Mobile (Chi.)
A	1.0 mil Bright Nickel—0.01 mil Chromium*	4.5	6.0	5.0	8.4	9.1
B	1.0 mil Bright Nickel—0.03 mil Chromium**	6.0	8.0	7.0	3.9	5.2
C	1.0 mil Nickel 80% sulfur free—20% Bright Nickel—0.1 mil Chromium*	5.5	9.0	9.5	8.4	9.0
D	0.4 mil Copper—0.8 mil Bright Nickel—0.03 mil Chromium**	9.3	9.4	6.0	8.8	9.4
	ZINC DIE CAST					
E	0.4 mil Copper—0.8 mil Bright Nickel—0.01 mil Chromium*	4.5	5.2	4.0		
F	0.4 mil Copper—0.8 mil Bright Nickel—0.03 mil Chromium**	7.7	6.7	6.0		
G	0.4 mil Copper—0.03 mil Chromium**—0.8 mil Bright Nickel—0.03 mil Chromium**	9.6	9.5	9.5		
H	0.4 mil Copper—0.8 mil Nickel 80% sulfur free—20% Bright Nickel—0.01 mil Chromium*	6.2	9.3	9.5		

*Conventional chromium, 110F, Ratio 100.
**High temperature (130F), High Ratio (135 to 165).

It is not in any way our intent to deprecate or discourage the use of the new accelerated tests, but rather to point out possible pitfalls if they are incorrectly used.

ACKNOWLEDGMENT

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THE POLAROGRAPHIC ANALYSIS OF GOLD AND GOLD ALLOY PLATING SOLUTIONS

by A. E. KNOTOWICZ* and GEORGE TATOIAN**

INTRODUCTION

THIS WORK is a part of a general study undertaken to develop polarographic methods for the analysis of plating solutions[1, 2, 3, 4, 5]. Several methods have been published for the polarographic determination of gold,[4] silver,[4, 6] copper,[1, 2, 4, 5] nickel[3, 4] and zinc[1, 4, 5, 7, 8, 9] in plating solutions. These methods, however, are specific for a given plating solution, involving the analysis of only one or two of the above-mentioned metals.

The object of this study was to develop a polarographic method for the analysis of gold, the elements commonly alloyed with gold, and impurities in gold plating solutions.

EXPERIMENTAL

Apparatus and Materials

Experimental data were obtained with a Patwin Model G-1† recording electropolarizer and a Model R-2 manual electropolarizer. Both units are internally standardized and calibrated with standard cells (1.019 v) and 0.1 per cent standard resistors. Electrolysis cells were Patwin Model No. 6B and Patwin research cells; resistance of the cells was below 100 ohms 1N KNO_3 as determined by a conductivity bridge; and the capillary constant was 1.830 $mg^{\frac{2}{3}}$ $sec^{-\frac{1}{2}}$ in 0.1N KNO_3 + 16 per cent mannitol. All experimental data were obtained with this capillary and constant.[4]

EXPLORATORY EXPERIMENTS

Several supporting electrolytes were tried for the determination of gold and the other alloying constituents of gold-alloy plating solutions. The values of the half-wave potentials are shown in Table I.

* The Patent Button Company, Waterbury, Connecticut.

** American Optical Company, Buffalo, N. Y.

† Presently manufactured by The American Optical Company, Buffalo, N. Y. American Optical Model 10300.

AMMONIUM HYDROXIDE AND AMMONIUM SULFATE

In 1 Normal solutions, the nickel and gold waves merge at $E_{\frac{1}{2}} = -1.4$ vs. S.C.E. It was also noted that the concentration of cyanide ion (CN^-) in the solution affects the diffusion current value observed for nickel. Satisfactory polarograms were obtained for copper, silver, nickel, and zinc after the gold was precipitated and the cyanides destroyed by digestion.

POTASSIUM CYANIDE

In 1 Normal solutions, the nickel and gold waves merge, but the cyanide concentration does not affect the diffusion current value fornickel. By using the nickel value obtained in the ammonium supporting electrolyte, a value for gold may be obtained by difference. Since copper and zinc give no response, silver may also be determined in this electrolyte.

TABLE I

POLAROGRAPHIC CHARACTERISTICS OF GOLD, SILVER, NICKEL, COPPER AND ZINC IN VARIOUS SUPPORTING ELECTROLYTES.

Half-wave potentials in Volts vs Saturated Calomel Electrode. In all cases, unless otherwise noted, 0.008 per cent gelatin was present as a maxima suppressor.

	1N NH_4OH* 1N $(NH_4)_2SO_4$	1N KCN 0.004% gelatin	6.8N $CaCl_2$ 1N HCl	5N NaCl
Au^I	N.R.	−1.34	N.R.	−1.06
Ag^I	− .05	−0.74	−0.10	−0.50
Ni^{II}	−1.10	−1.40	−0.53	−1.30
Cu^{II}	−0.24	N.R.	−0.20	
Cu^I	−0.48	N.R.	−0.40	
Zn^{II}	−1.42	N.R.	N.R.	

* Plating solution first digested with nitric and sulfuric acids.

Fig. 1. Patwin Model G-1 Electropolarizer.

Fig. 2. Patwin Model R-2 Electropolarizer.

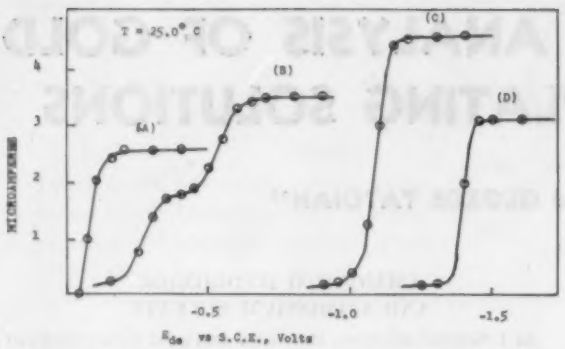

Fig. 3. Polarograms of copper, silver, nickel, gold and zinc in 1N NH_4OH + 1N$(NH_4)_2SO_4$, with 0.008 per cent gelatin present as a maxima suppressor. (A) 0.0006M Ag^I, (B) 0.0005M Cu^{II}, (C) 0.0007M Ni^{II}, (D) 0.0005M Zn^{II}. No polarographic wave for gold because of digestion of sample with nitric and sulfuric acids.

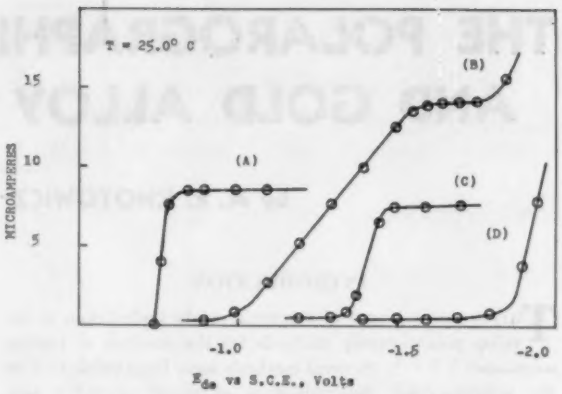

Fig. 4. Polarograms of copper, silver, nickel, gold and zinc in 1N KCN, with 0.004 per cent gelatin present as a maxima suppressor. (A) 0.0024M Ag^I, (B) 0.0039M Au^I, (C) 0.0010M Ni^{II}, (D) 0.0005M Cu^I and 0.0009M Zn^{II}. Residual current curve for 1N KCN. No wave observed for Cu^I and Zn^{II}.

ACID CHLORIDE ELECTROLYTES

In acid chloride electrolytes, solutions of gold cyanide impart a pink color, probably due to the formation of gold chloride. Silver and nickel additions have no effect but copper cyanide gives a precipitate (probably copper, as no polarographic wave for copper is observed). These supporting electrolytes were not used because of the precipitation of the copper and because the gold does not give a polarogram which is quantitative.

NEUTRAL CHLORIDE ELECTROLYTES

In neutral chloride electrolytes, silver, gold, and nickel give a polarographic wave but copper does not. These supporting electrolytes were not used because the separation between the gold and nickel waves is not clearly defined, the gold wave is well defined only within very limited concentrations of gold vs maxima suppressor, and a copper wave is not observed.

ANALYTICAL METHODS

Owing to the differences in concentration of both alloying constituents and impurities in a plating solution, as shown in Table II, specific dilutions are not given in the analysis procedure. The dilution of the plating solution should result in a concentration of unknown ions which is 0.0005 to 0.003 molar.

PROCEDURE

Gold

Supporting electrolyte: 1N KCN (0.004 per cent gelatin).

The diffusion current for gold is read as the difference between the current at −0.95 volts and the current at −1.7 volts.

A current at −0.95 volts in excess of 0.3 microamperes will indicate presence of silver.

Nickel produces a wave which coincides with the gold wave; therefore, if nickel is present a correction must be applied to the diffusion current value for gold.

Silver

Supporting electrolyte: 1N KCN (0.004 per cent gelatin).

The diffusion current for silver is read at −0.95 volts

Copper, Nickel and Zinc

These elements are determined in one sample after gold is precipitated and the cyanides destroyed by digestion with nitric and sulfuric acid. If silver is present, the silver wave will coincide with the first copper wave ($Cu^{II} \rightarrow Cu^I$).

Supporting electrolyte: 1N NH_4OH + 1N $(NH_4)_2SO_4$ (0.008 per cent gelatin).

The sample is pipetted into a 50 ml volumetric flask, 1 ml of concentrated nitric acid and 3 ml of concentrated sulfuric acid are added, and the solution is heated until sulfur trioxide fumes are evolved and a brown coagulate of gold is obtained. After cooling, gelatin is added and the residue is diluted to 50 ml with the supporting electrolyte. The precipitate (if any) is allowed to settle or the solution can be filtered.

Copper

The diffusion current for copper is read at −0.80 volts. If silver is present, a correction must be applied to this diffusion current value.

Nickel

The diffusion current for nickel is read as the difference between the current at −0.80 volts and the current at −1.275 volts.

Zinc

The diffusion current for zinc is read as the difference between the current at −1.275 volts and the current at −1.60 volts.

TABLE II

COMPOSITIONS OF GOLD PLATING SOLUTIONS*

	K Au $(CN)_2$ (dwt/gal)	$K_2Ni(CN)_4$ (g/gal)	$K_3CU(CN)_2$ (g/gal)	K Ag $(CN)_2$ (g/gal)
24 K Color Plate...	3–5			
Yellow Gold.....	3	1.5	0.5	
Hamilton Gold.....	3	1.5	4.0	
Green Gold.....	5			1.0
White Gold.....	1.5	4.0		
Pink Gold.....	2.0	0.8	10.0	
Rose Gold.....	15.0			

* Metal Finishing Guidebook Directory

TABLE III

Synthetic plating solutions containing varying concentrations of all the elements either as impurities or as alloying constituents, disodium phosphate, sodium hydroxide and sodium carbonate, and free cyanide were prepared and analyzed by both chemical and polarographic methods. The chemical analysis was by the methods outlined in the "Metal Finishing Guidebook Directory—1958"; the polarographic analysis was by the methods outlined in this paper.

A comparison of polarographic and chemical results is shown below.

	Chemical	Polarographic
Gold	9.89 dwt/gal	9.98 dwt/gal
Copper	3.25 g/gal	3.21 g/gal
Nickel	4.42 g/gal	4.36 g/gal
Silver	0.91 g/gal	0.90 g/gal
Zinc	0.62 g/gal	0.65 g/gal

CORRECTION FOR INTERFERING IONS

Correction for Nickel in Gold Analysis

(a) A calibration curve* for nickel in 1N KCN is obtained with the nickel current read as the difference between the current at −0.95 volts and the current at −1.7 volts.

(b) A nickel analysis, of the unknown containing both gold and nickel, is obtained in 1N NH_4OH + 1N $(NH_4)_2SO_4$. (The gold is first precipitated from the sample in the manner outlined previously).

(c) A diffusion current value for the unknown containing both gold and nickel is obtained in 1N KCN.

(d) From the diffusion current for both nickel and gold (Step C) subtract the current due to nickel. The current due to nickel is determined from the quantitative analysis in 1N NH_4OH + 1N $(NH_4)_2SO_4$ (Step B) and the calibration curve for nickel in 1N KCN (Step A).

Correction for Silver in Copper Analysis

(a) A calibration curve* for silver in 1N NH_4OH + 1N $(NH_4)_2SO_4$ is obtained with the silver current read at −0.8 volts.

(b) A silver analysis, of the unknown containing both silver and copper, is obtained in 1N KCN.

(c) A diffusion current value for the unknown containing both silver and copper is obtained in 1N NH_4OH + 1N $(NH_4)_2SO_4$.

(d) From the diffusion current for both silver and copper (Step C) subtract the current due to silver. The current due to silver is determined from the quantitative analysis in 1N KCN (Step B) and the calibration curve for silver in 1N NH_4OH + 1N $(OH_4)_2SO_4$ (Step A).

SUMMARY

The metal plated is usually nickel, copper, brass or silver, and these ions may also be found as impurities. The most common alloying constituents in a gold solution are silver, nickel and copper. The supporting electrolytes used for analysis are as follows:

(1) **Plating Solutions**
Gold 1N KCN (with a correction for nickel)
Silver 1N KCN or 1N NH_4OH + 1N $(NH_4)_2SO_4$
Copper 1N NH_4OH + 1N $(NH_4)_2SO_4$ (with a correction for silver)
Nickel 1N NH_4OH + 1N $(NH_4)_2SO_4$
Zinc 1N NH_4OH + 1N $(NH_4)_2SO_4$

(2) **Impurities**
(a) Will not interfere in KCN (in an analysis for nickel and gold).
(b) May be determined in ammonia medium when a nickel analysis is made. However, if both copper and silver are present, these waves will merge. The silver is then determined in KCN and the copper is determined by differences.

ACKNOWLEDGMENTS

The authors wish to express their appreciation to Dr. J. V. Petrocelli of International Nickel Corporation, for his invaluable aid as director of research at the Patent Button Company during the course of this work; and to Mrs. Lily Shao Lin who assisted in performing the experimental work.

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* The method for obtaining calibration curves has been discussed in "The Polarographic Analysis of Nickel Plating Solutions" by J. V. Petrocelli and G. Tatoian, Reference (3).

A. E. Knotowicz received a BS in Chemistry in 1948 from Holy Cross College. He is a research engineer with The Patent Button Company, Waterbury, Connecticut, where he is active in research and development in electronics, instrumental analysis, instrumentation and electroplating. Mr. Knotowicz is a member of the American Association for the Advancement of Science, Institute of Radio Engineers, The Electrochemical Society, and The American Electroplaters' Society.

George Tatoian obtained his BS in chemical enginering in 1944, at Missouri School of Mines and Metallurgy, University of Missouri. He is assistant sales manager of the Instrument-Division, American Optical Company, Buffalo, New York. He has authored several papers on polarographic procedures and flame photometry, and the book "Polarographic Methods of Analysis for Plating Solutions." Mr. Tatoian is a member of the American Chemical Society and the American Electroplaters' Society.

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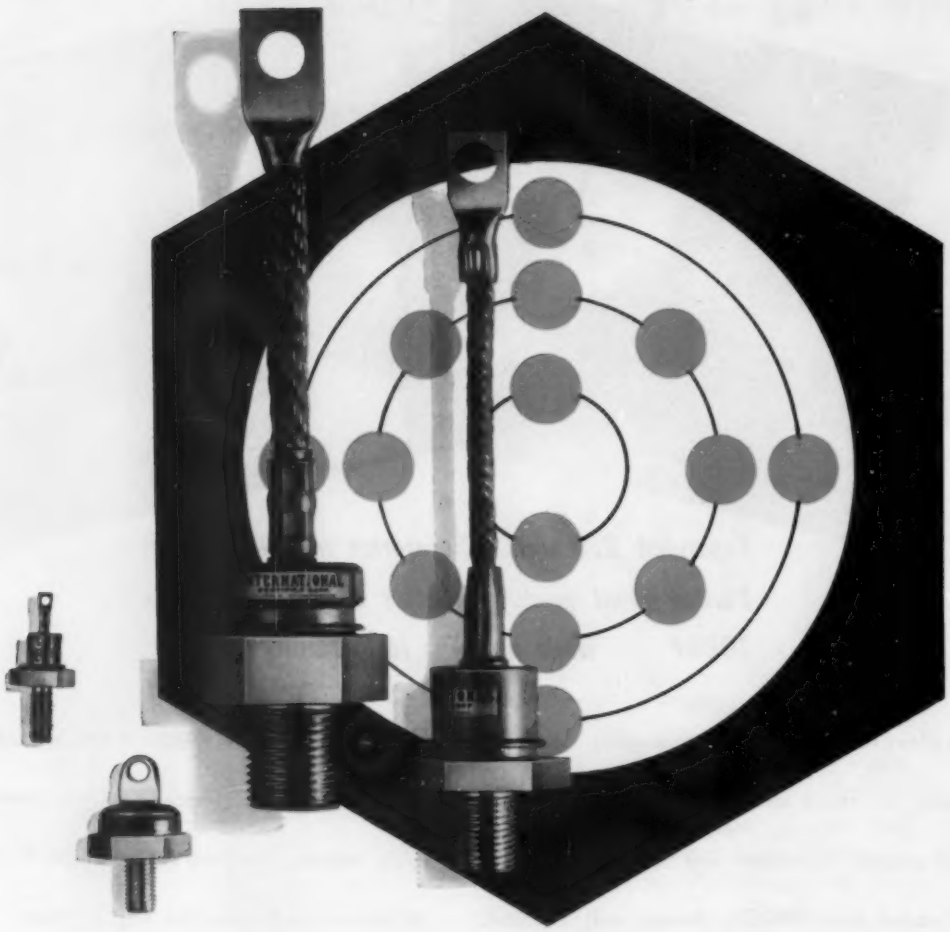

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AES COMES TO AMERICA'S WEST

TWENTY YEARS after its birth, namely in 1929, ebb of our nation's "Fabulous Twenties," American Electroplaters' Society, Inc. (AES) followed Horace Greeley's historic advice and headed West for broader progress. The two-decade way to that forward move was paved thus.

As the National Electro-Platers Association of the United States and Canada (NEPA), the AES was created in 1909 when the United States had 46 States and a population of about 90 million, with less than 200,000 automobiles and 6,000 trucks on its assembly lines. From New York genesis, it branched to Philadelphia where a Branch was originated in 1910. The Society became international with the birth of its Toronto Branch in 1912. NEPA became AES in 1913, still a New York educational non-profit corporation, the transition occurring at its First Annual Convention, a historic event held on June 1, 1913 in New York City, its birthplace. By year-end 1913, AES comprised 13 Branches. Only a year later, by the way, the Society's burgeoning four-year old magazine, QUARTERLY REVIEW, became MONTHLY REVIEW, immediate forerunner of today's PLATING MAGAZINE.

And so in 1929, numbering some 1,500 members and 25 Branches, AES crossed the American continent and founded its Los Angeles Branch, first west of St. Louis. It compounded its West Coast entry with the creation of its San Francisco Branch in 1930. Both lived and prospered. But over two more decades elapsed before they were supplemented by other AES Branches in the broad American area from the Mississippi River to the Pacific Ocean.

Then in America's "Dynamic Fifties", AES dotted that region with active Branches. It penetrated the great State of Texas with a Branch in Dallas-Fort Worth in 1951. Its Jayhawker Branches were founded in Wichita and in Kansas City in 1952. Its Portland, Oregon, Branch was conceived in 1953. It added Texas Branches in Houston and San Antonio in 1954, and entered the State of Washington with its Seattle Branch in that same year. A year later, Seattle enveloped Puget Sound thus becoming the Seattle-Puget Sound Branch of today. And in 1957, in the Canadian West Coast, AES chartered its present British Columbia Branch with headquarters in Vancouver. Finally, in 1959, in AES's GOLDEN JUBILEE YEAR, AES came to Colorado with a promising Branch in Denver, and to Arizona with a Branch in Phoenix.

In 1960, in its fifty-first year, AES has reached another milepost of progress. Composed of 50 Branches in the United States, 5 in Canada, 3 in Australia, and stronger than ever in its long lifetime—internationally reputed and respected for its service over a half-century span in stimulating advancements in electroplating, metal finishing and allied arts—it will conduct its first Annual Convention on the Pacific Coast, naturally with its Far West pioneer Branch, Los Angeles, as host.

The AES family will make the long trek to the "Golden City" not only as a token of esteem for its trailblazing Los Angeles Branch, and to partake of the vaunted educational and relaxational fare of that wonder city, but also to accommodate and honor its other chartered Branches in that broad area from St. Louis to the shores of the Pacific, namely San Francisco, Portland, Seattle-Puget Sound, British Columbia, Dallas-Fort Worth, Houston, Kansas City, Wichita, Denver and Phoenix.

Thus East and West will join in '60 in an historic first step toward the even greater AES transcontinental Branch unity that seems destined in the "Space Age Sixties," facilitated by the miracles in neutralizing distances being engineered by developments in American and Canadian transportation.

AES's LIVING PAST PRESIDENTS

Edward J. Musick
1925–1926

Frank C. Mesle
1926–1927

H. A. Gilbertson
1934–1935

Austin B. Wilson
1937–1938

William M. Phillips
1938–1939

Frederick Fulforth
1940–1941

Ellsworth T. Candee
1941–1942

Charles C. Conley
1942–1943

George J. Wagner
1943–1944

M. R. Caldwell
1944–1945

Walter L. Pinner
1945–1946

Frank K. Savage
1946–1947

Kenneth M. Huston
1947–1948

Samuel S. Johnston
1948–1949

Arthur W. Logozzo
1949–1950

William J. Neill
1950–1951

Cleveland F. Nixon
1951–1952

Dr. George P. Swift
1953–1954

Dr. R. A. Schaefer
1954–1955

Clyde Kelly
1955–1956

Dr. Samuel Heiman
1956–1957

Francis T. Eddy
1957–1958

Herberth E. Head
1958–1959

ANNUAL REPORT*

PRESIDENT'S REPORT

AMERICAN ELECTROPLATERS' SOCIETY, INC.

By

RALPH D. WYSONG

IT HAS been just one year since we celebrated our Fiftieth Anniversary in Detroit with the big Golden Jubilee Convention, Exposition and International Conference. So many times, when great effort is extended for an outstanding climax, there is a tendency for a let-down or relaxation to follow. We are very happy to state that no such malady has infected our Society during this past fiscal year, 1959-1960. Action has not only continued at the regular pace but at an improved tempo.

COOPERATION AS BRIDGE TO PROGRESS

The Executive Board has held five meetings during the year and worked harmoniously on all problems and projects necessary not only for the smooth operation of our Society but also for its steady growth and advancement. Regular attendance by all National Officers at every meeting has also expedited the handling of Society business.

Visits to many Branch and Regional meetings have proved the quality of Branch educational sessions, which, along with the enthusiasm of the individual members, speaks well for the quality and future of our Society. Progress in the regionalization of Branches, and the formalization thereof, is another indication of the evolution of our Society. Close, harmonious cooperation between the Branches and National Headquarters has also been a large factor in our effectiveness.

REWARDS OF CONTINUOUS IMPROVEMENT

The Standing Committees, namely Editorial, Publications, Research, Public Relations, Educational, Membership, Law, Credentials, AES Scientific Achievement Award and the Charles H. Proctor Memorial Leadership Award have all functioned well and made marked advancement. The many Presidential appointees, along with other Committees and many individuals, have without exception, performed their special tasks to the satisfaction of all. The great extent to which organic finishing has been accepted as a part of our Society's program in the past four years, is an outstanding example of this effort.

Our warmest thanks and congratulations to all who have so unselfishly served during the past year, and congratulations for jobs well done!

PLATING MAGAZINE, the Society's magazine, has steadily advanced to an outstanding position in the metal finishing field as evidenced by the favorable "ABC" reports. Our 1959 TECHNICAL PROCEEDINGS has been recognized as one of the outstanding publications of its kind.

The Interim Meeting was held at Philadelphia in conjunction with that Branch's Fiftieth Anniversary. Thirty Branches were represented at the meeting. The 1960 Convention Chairman from Los Angeles reported that everything is going as scheduled, and the hard work of all committees will insure good educational and recreational experiences for all who attend.

Ralph D. Wysong

* AES's fiscal year, as altered by the Supreme Society effective in 1958, now spans from July 1 through June 30 instead of April 1–March 30 as before. So as to publish this Annual Report for the current fiscal year (July 1, 1959 through June 30, 1960) for issuance to Delegates in advance of the Annual Meeting of the Supreme Society, and so as to publish it in the Convention Issue of PLATING MAGAZINE (June 1960), it manifestly can cover only the nine-month period ending March 31, 1960, as last year. A complete certified financial statement for the full fiscal year will be published as promptly as possible after audit and certification by Clyde A. Zukswert & Co., Newark, N. J., certified public accountants.

DENVER AND PHOENIX BRANCHES CHARTERED AT GALA INSTALLATION EVENTS

(Left) Governor Paul Fannin of Arizona welcomes AES at Scotsdale, Arizona installation October 9, 1959. (Center) National President Ralph D. Wysong installs Denver Branch officers at Branch induction, Denver, October 13, 1959. (Right) Attorney General Duke W. Dunbar welcomes AES to Colorado at same event.

YOUR PRESIDENT APPRECIATES AND THANKS

Again, we wish to express our thanks and appreciation to the many workers who have made possible any success we have experienced this year. These tireless workers, and those who follow them in the coming years, will assure a bright future for our Society.

To the Studebaker-Packard Corporation, for its understanding and cooperation, we wish to express our sincerest thanks.

The many new friends we have made, and the wonderful people we have met during the past couple of years, have made it a distinct privilege and pleasure to serve as your President.

IN CONCLUSION

For our last statement to the AES as its President, we wish to leave with you the parable of the "Glowing Coal".

Several Scoutmasters were discussing the Boy Scout organization while sitting around a cheerful campfire late one evening. The leader was extolling the benefits of good organization and cooperation between workers, and used the campfire as a demonstration. "You will observe," he said, "that all coals and sticks are burning merrily, giving off light and heat only so long as they are arrayed together in an orderly manner. Let one coal be removed from the fire and placed to one side. It glows for a while and then goes out. Replace it with the others and it will soon be glowing again, giving off light and heat with the others".

So it is with our Society, the Branches and the Regions. As long as we are working together as an orderly organization, we will approach our goal and have a positive influence upon all with whom we come in contact.

Dr. W. Andrew Wesley

FIRST VICE PRESIDENT'S REPORT

by

DR. W. ANDREW WESLEY

AES Bylaws make the First Vice President a member of the National Educational Committee. The President customarily looks to him to keep the Executive Board informed as to the educational activities of the Society in general. While many of the papers presented at the national convention and those published in PLATING MAGAZINE are educational in nature, they are not a concern of the First Vice President. The status of such publishing activities is amply reviewed in other annual reports.

PLATING COURSES

The classes held under AES Branch sponsorship are a directly educational activity. This program has grown to the extent that there are now at least 15 classes studying in 12 states and 3 Canadian provinces. A subcommittee of the National Educational Committee includes in its membership two professional pedagogues who are college professors. This subcommittee is preparing standard outlines for three electroplating courses that will satisfy the needs of (1) practical platers, (2) intermediate level operators and (3) more technically trained supervisors of plating operations. Another subcommittee has been organized to attempt to do the same for an organic finishing course and still another for correspondence courses. To encourage greater attendance at classes, the Committee wishes to provide a uniform certificate of completion which would be awarded to each graduate of the Branch-sponsored courses. The Committee is also seeking to promote suitable recognition of the many instructors who are doing the AES such splendid, unselfish service in conducting the classes.

BRANCH SPEAKERS LIST

Branch Librarians and those responsible for the educational sessions at regional meetings are unanimous in praise of the new Branch Speaker's List. Preparation of this catalog each year is a major function of the National Educational Committee. While the inclusion of abstracts of the talks has enlarged the size and cost of the List, this expense seems eminently worthwhile. The 1960 List will include an offer by the six National Officers to talk at any Branch meeting on the subject of the activities of the

AES AND MFSA BOARDS IN JOINT MEETING, PHILADELPHIA, FEBRUARY 19, 1960

At the AES Philadelphia Branch's Fiftieth Anniversary observance, the Friday evening joint meeting (above) of the American Electroplaters' Society Executive Board and the Metal Finishing Suppliers' Association Board of Trustees. Ezra A. Blount, Eugene Combs, Chester G. Borlet, Earl W. Couch, Manuel Ben, Dr. Henry L. Kellner, Manson Glover, Ralph D. Wysong, Herberth E. Head, John P. Nichols, Harold J. McCracken, Robert M. Norton, Fred P. Green, A. P. Munning, John Trumbour and Sherman M. Goble.

Society. They will continue to accept direct invitations from Branches or Regional Groups to the extent that the demands of their own business duties and other commitments will permit.

IN CONCLUSION

Your First Vice President is happy to report that all Society activities with which he has been in contact in the line of duty during the past year have demonstrated a gratifying degree of health and vigor. This means, of course, that hundreds of committee members and officers are performing their duties conscientiously and then are giving them that extra, overtime push that yields outstanding results.

At the Branch and Regional levels the educational aims of the Society are being better served than ever before. It is true that rivalry between Branches can be stimulating. But the improvement in quality of programs and attendance observed when Branches cooperate in Regional meetings is now obvious to all. I seriously urge support of the spreading movement toward the cooperation of Branches in Regional Groups.

Chester G. Borlet

SECOND VICE PRESIDENT'S REPORT

by

CHESTER G. BORLET

IN 1957 when the Supreme Society wisely created the National Membership Committee, it made it mandatory that the Second Vice President serve on this Committee. What better way for an elected National Officer, in his succession of offices, to learn the rudiments of membership promotion in our Society. Officers are certainly better equipped to understand the membership promotion affairs of the Society through their experience with this Committee.

NATIONAL MEMBERSHIP COMMITTEE

Your Membership Committee under the able direction of M. Lester Reynolds, Chairman, met twice this year. As a result, two continuing projects and one initiated project were completed. Furthermore, the National Membership Committee Bylaws were amended. Besides, there are two active projects in progress and a number of future projects to be explored. Here is the tally.

PROJECTS COMPLETED

1. A two-color gatefold membership leaflet including application blank. This leaflet is so designed that it is pinpointed to the very type of Branch member desired. Reports to date by those Branches using this promotional piece indicate it will substantially help to promote membership.
2. A proposed twenty-five-year longevity certificate honoring long and continuing membership in a Branch has had Executive Board approval and is in process of production. Upon serving his Branch faithfully for twenty-five years, each member of a Branch that elects to participate in this project will receive one of these certificates direct from his Branch. The Branch, in turn, will have purchased copies of these standard certificate blanks from National Headquarters, and will itself have had them personalized to apply to its Branch members to whom it had determined eligible for award.
3. Each Branch of our Society has been urged to foster the purchase and wear of the AES's silver membership lapel button by its members, new or old. By doing so, the member will not only himself be aware that he is affiliated with a progressive Society but will demonstrate it to others.

PROJECTS IN PROCESS

1. A carefully edited letter is to be issued to each Branch Secretary covering a number of subjects which in the opinion of the Membership Committee are of prime importance in selling new memberships and retaining present memberships. Subjects to be covered include,
   (a) Importance of strong Branch Officers;
   (b) Importance of the Branch Officers Manual, particularly the section on membership promotion,

HEAD TABLE AT PHILADELPHIA BRANCH'S FIFTIETH ANNIVERSARY BANQUET

Philadelphia Branch records fell in February when that Branch, the AES' second oldest, conducted its two-day Educational Sessions and Banquet, February 19–20, concurrently with the SEVENTH INTERIM MEETING. Above, the Head Table at the Banquet that broke that Branch's attendance marks. The two Educational Sessions featured experts who collaborated in bringing those sessions appraisal as among the most educationally valuable of the 1960 Educational Season.

MEMBERSHIP CENSUS AS OF APRIL 1, 1960

BRANCH	BRANCH MEMBERS JULY 1, 1959	ELECTED	REINSTATED	IN TRANSFER	OUT TRANSFER	RESIGNATIONS	SUSPENSIONS	DEATHS	BRANCH MEMBERS APRIL 1, 1960	SUSTAINING MEMBERSHIPS
Adelaide	35	—	1	—	—	—	4	—	32	—
Allentown-Reading	37	10	1	2	1	—	2	—	47	4
Baltimore-Washington	109	5	—	2	—	—	7	—	109	3
Blue Ridge	35	10	1	4	—	2	6	—	42	—
Boston	180	12	4	1	1	—	50	1	145	4
Bridgeport	143	13	2	—	1	1	7	2	147	6
British Columbia	42	5	1	—	1	3	4	—	40	—
Buffalo	106	11	1	2	2	5	6	—	107	1
Capitol District	35	5	1	2	—	1	8	1	33	1
Central Michigan	61	2	—	—	—	2	10	—	51	—
Chicago	453	22	2	—	5	3	50	4	415	65
Cincinnati	113	4	4	1	2	3	15	1	101	1
Cleveland	260	13	3	4	2	12	22	2	242	19
Columbus	79	6	1	—	2	1	2	—	81	—
Dallas-Fort Worth	58	12	2	—	—	1	—	—	71	1
Dayton	111	5	—	3	5	3	8	—	103	4
Denver (A)	31	12	—	4	—	—	5	—	42	—
Detroit	695	38	3	5	9	11	53	3	665	63
Grand Rapids	174	8	3	—	2	—	13	—	170	19
Hamilton	51	6	3	—	—	—	11	1	48	1
Hartford	172	9	1	—	4	3	12	1	162	4
Houston	31	2	—	—	—	1	—	—	32	1
Indianapolis	130	16	—	1	1	1	7	—	138	4
Kansas City	62	2	—	1	—	—	8	—	57	1
Lancaster	65	2	2	1	2	3	2	—	63	—
Los Angeles	278	10	23	2	1	1	9	—	302	19
Louisville	51	3	—	—	3	5	—	—	46	—
Melbourne	159	4	3	—	—	1	—	—	165	—
Memphis-Midsouth (B)	—	16	—	2	—	—	—	—	18	—
Miami	38	15	5	2	—	—	13	—	47	—
Milwaukee	207	5	—	3	—	—	19	—	196	10
Mississippi Valley	59	6	4	—	—	4	18	—	47	—
Mohawk Valley	48	4	4	—	—	—	13	—	43	—
Montreal	112	9	—	—	—	8	2	—	111	2
Newark	354	36	3	—	6	4	30	1	352	10
New Haven	119	8	—	—	—	2	27	—	98	5
New York	354	17	1	3	3	5	13	2	352	14
Philadelphia	241	10	10	3	3	2	23	1	235	11
Pittsburgh	130	6	1	3	3	10	12	1	114	4
Phoenix (C)	27	12	—	—	—	1	—	—	38	—
Portland	33	—	—	—	—	—	5	—	28	—
Providence-Attleboro	96	13	—	—	1	3	5	—	100	2
Rochester	84	4	—	2	—	—	1	—	89	5
Rockford	84	8	—	—	1	—	10	—	81	1
Saginaw Valley	114	11	—	—	1	5	3	1	115	1
St. Joseph Valley	119	6	—	—	—	—	15	—	110	8
St. Louis	109	7	4	—	1	1	9	—	109	11
San Francisco	84	21	3	1	1	6	12	1	89	2
Seattle-Puget Sound	34	3	1	2	—	1	4	—	35	1
Southeastern	102	3	—	—	3	3	7	—	92	1
Southern Tier	48	1	—	—	—	2	5	—	42	1
Springfield	76	3	1	—	—	5	5	—	70	2
Sydney	97	2	—	—	—	5	2	—	92	—
Syracuse	77	7	1	—	1	2	7	—	75	1
Toledo	46	5	1	1	—	1	5	—	47	2
Toronto	191	6	—	—	1	2	11	—	183	14
Waterbury	141	6	—	1	2	1	3	1	141	17
Western Ontario	28	4	—	—	1	—	1	—	30	3
Wichita	31	—	—	—	—	—	2	—	29	—
Subtotal	7039	501	101	58	72	136	603	24	6864 (D)	349
Members-at-Large	246	24	19	5	2	10	41	1	240 (D)	—
Grand Total	7285	525	120	63	74	146	644	25	7104 (D)	349

Notes:

(A) Chartered October 13, 1959.
(B) Temporary Charter February 23, 1960.
(C) Chartered October 9, 1959.
(D) In addition, the Society's membership included 350 Sustaining Memberships (including one foreign) at April 1 1960 for an aggregate Society Membership, in all membership classifications, of 7454 AES members on April 1, 1960, compared with 7613 on July 1, 1959 or a net loss of 159 members or about 2 per cent. (See Executive Secretary's Report.)

(c) Consultation service by the National Membership Committee Members, where and when possible, to assist with Branch membership promotional plans at Branch level.
(d) Names of the Regional Membership Promotion Chairmen who may be called on by a local Branch in a region for membership promotional counsel.

2. Stimulation of formation of active Membership Committees at Branch level and "Work Shops" at Regional level, and persistent prodding for effectiveness. Both have had initial try outs. Reports indicate these plans show decided promise.

PROJECTS IN DISCUSSION

1. It has been suggested that one month of the local Branch year be set aside and designated as "Membership Promotion Month". All Branch non-educational activities during the month selected would be concentrated upon membership promotion. Visual aids helpful to membership attraction would be used.
2. There has even been some preliminary discussion as to the desirability and practicability of suggesting the production of an AES motion picture for membership promotion, and there may be exploration of the subject with other Society bodies, including the Public Relations Committee.

BRANCH GROWTH NUMERICALLY

This year saw two Branches leave our fold. One Branch withdrew and the other had its Charter revoked. To offset this loss, two new Branches were granted Permanent Charters. National President Wysong and National Executive Secretary Nichols installed the new Denver and Phoenix Branches early in the Fall and presented them with their Charters.

In the month of February, the Memphis-Midsouth Branch applied for and was granted a Temporary Charter. As soon as it qualifies, a permanent Charter will no doubt be granted. The total number of Branches will then be fifty-nine.

BRANCH MEMBERSHIP SIZE NATIONALLY

Branch Membership, nationally, on July 1, 1959 was itself 7039. As of April 1, 1960, it was 6864. Mainly due to Branch streamlining at Per Capita Tax time, this shows a decline of 175 Branch members for the nine-month fiscal period to April 1, 1960. Branch membership is seemingly on the increase, however, and at fiscal year-end should be at normal or better.

The Branch winners of the Society's Annual Branch Membership Expansion Competition covering the current fiscal year (July 1, 1959-June 30, 1960) will be announced at the Annual Meeting of the Supreme Society in Los Angeles in July. At the six-month point, meaning at January 1, 1960, the following Branches were in the lead:

Category	Branch	Per cent gain
Class A—126 or more	Los Angeles	8.5
Class B— 70 to 125	Rochester	3.6
Class C— 69 or less	Phoenix	33.3

SUSTAINING MEMBERSHIP RISES

This year, AES members will be encouraged to note that Sustaining Memberships are on the increase. Compared with 328 such memberships on July 1, 1959 there were 349 on April 1, 1960. Much of the gain may be attributed to the zealous work of inspired and active Branch teams working to bring about such increases.

IN CONCLUSION

Even though the membership has gone through a period of some readjustment, it is my opinion that we can look forward to continued healthy and normal growth. I do, however, feel we should take a solid approach in acquiring new members and a good look at Branch quotas.

Prospective members should be carefully screened with particular attention given to qualifications. When the applicant is elected to Active Membership, it should be his sponsor's responsibility, as well as that of Branch members, that he immediately become active, or today's member will be tomorrow's suspension.

Local Branches might consider setting membership increase quotas at a level that would insure the membership taking an active part in Branch affairs. Quotas would indirectly tighten up admission requirements and in turn, make it an honor to gain admittance.

It is with a sense of gratitude that I offer my appreciation to my employer, the Grand Rapids Brass Company who, realizing the importance of the American Electroplaters' Society, has graciously allowed me the time to serve you in the capacity of Second Vice President of the Society.

In Memoriam

ASIDE from its Founding Fathers and the multitude of members who died since its creation over a half-century ago, American Electroplaters' Society, in this its fifty-first year, also mourns the loss of the following members who passed away during 1959-1960. Their devotion to the Society and their contributions to its progress will long honor their memory.

FOUNDING FATHERS

William J. Schneider (New York)

HONORARY MEMBERS

Dr. Hiram S. Lukens (Philadelphia)

MEMBERS

BOSTON:
Morris E. Baker

BRIDGEPORT:
Mederrick J. Brassard
Raymond J. Kwasnik

CAPITOL DISTRICT:
Merle W. Shaw

CHICAGO:
William H. Barron
Kenneth J. Birdwell
Arnold W. Borggren
Harry E. Gilles
Henry Weiland

CINCINNATI:
John H. Bruewer

CLEVELAND:
James T. Saas
Frank A. Truden

DETROIT:
Chester Ellison
Charles D. Gerard Jr.
T. Curtis McKenzie
Robert L. Reed
Clifford R. Roberts

HAMILTON:
Daniel Mundy

HARTFORD:
Armand Faucher

LOUISVILLE:
James D. Evans

MEMBER-AT-LARGE:
A. B. Canning

MILWAUKEE:
Louis N. Bush

NEWARK:
John Gunther
Milton A. Trevhaft

NEW YORK:
Alexander N. Braun
J. Frank Davis

PITTSBURGH:
Leo J. Schmitt Sr.

SAGINAW VALLEY:
James A. Littell

SAN FRANCISCO:
John Glasner

SYDNEY:
L. R. Hopkinson

WATERBURY:
John E. Larkin

WESTERN ONTARIO:
Cecil P. Bolt
Hugh C. Stonehouse

THIRD VICE PRESIDENT'S REPORT

by

MANUEL BEN

DURING the past year, I had an excellent opportunity as your Third Vice President to study first hand the operation of the Society. I familiarized myself with the Constitution and Bylaws and with the responsibilities of the Executive Officers, National Headquarters, Branches, and various Committees. I have become vitally interested in finances and publishing as they concern the Society.

To promote maximum attendance of the AES 1960 Los Angeles Convention, the President assigned me the task of exploring the possibility of cooperative airline travel arrangements. Meetings were held in Detroit with representatives of the major transcontinental airlines. Pertinent information was then mailed to each Branch Secretary for consideration on a Branch level.

Manuel Ben

Herberth E. Head

There are no Constitutional or Bylaw amendments pending or offered at this time.

IN CONCLUSION

It has been my privilege to attend all the Executive Board Meetings, four Branch Annual Meetings, two Regional Meetings, two Branch Meetings, and all the regular meetings of the Detroit Branch. I was sorry that due to previous commitments, I was unable to accept all the invitations extended to me to attend the various Branch Meetings. During my travels, I met many AES members who shared with me their experiences in promoting AES.

I am proud to be a member of the AES Executive Board and I am deeply grateful for the privilege of holding the office of Third Vice President.

PAST PRESIDENT'S REPORT

by

HERBERTH E. HEAD

THIS is my last report to you as a member of your National Executive Board. The Past President, constitutionally, has no specific assignment but is usually given some project by the President or the Executive Board. Such has been the experience of your Immediate Past President—specifically, to study and subsequently report to the Board his findings concerning the desirability of creating a Board Committee to consider the need for altering the governmental framework of the American Electroplaters' Society. This report will be submitted to the Board in the near future.

It is most gratifying to be able to report to you that your National Headquarters is in the hands of a competent business man, John P. Nichols, who has surrounded himself with a very capable staff, and who is doing an outstanding job in serving you.

THE SOCIETY AND ITS SERVICES

May I next take this opportunity to discuss with you, the all-important matter of service? Service is something that the membership has a right to expect from your National Office and will abundantly receive if you provide the wherewithal to render this service, namely money. For some reason that I cannot conceive, we seem to have an idea that we have a right to expect unlimited services with no additional expense. Such cannot happen in your own business. This being the case, how can we expect it to happen in our Society?

You may recall, as an instance, that at the Montreal Convention, the Supreme Society (the Delegates) began acting like politicians—voting to increase the cash values of Paper Awards, even adding a couple; establishing new structures and new committees, increasing the number of members of existing committees, etc. All of which was good—if money had also been provided to carry on these newly created activities.

As you may recall, a Per Capita Tax increase was proposed to provide the necessary working capital to accomplish these progressive ideas. Needless to remind you that this proposal was defeated. Yet we continue to demand more and more service but when the appropriation of money to carry on the added services is mentioned, we turn a deaf ear to the plea. This business of operating in deficit is Society suicide. It is about time that we began to realize that if we want to dance, we must pay the fiddler.

IN CONCLUSION

I am grateful to the members of the American Electroplaters' Society for giving me the opportunity to be of service. It is an experience that will never be forgotten.

It is with humble sincerity that I also express my appreciation to the Chrysler Corporation for making time and funds available without which this assignment could not have been carried out.

AES's MIDWEST REGIONAL COUNCIL CONDUCTS EFFECTIVE EDUCATIONAL CONFERENCE AT ROCKFORD COLLEGE

A large audience attended and was benefited by the effective First Annual Regional Conference of the Midwest Regional Council held at Rockford (Ill.) College, Saturday, November 7, 1959. Featuring a forenoon Organic Workshop Session moderated by Council Chairman Leslie L. Diveley and an Inorganic Workshop Session moderated by AES National President Ralph D. Wysong, each with panels of prominent experts, the Conference also heard Dr. William Blum at luncheon. The outstanding afternoon session was moderated by Past National President Clyde Kelly. Above left, a view of the Speakers' Table at luncheon. Then a view of the popular exhibits of plated parts arranged by members of the Midwest Council. At extreme right, the morning's Inorganic Workshop Session.

EXECUTIVE SECRETARY'S REPORT

by

JOHN P. NICHOLS

AMERICAN Electroplaters' Society's (AES) fiscal year thus far, meaning from July 1, 1959 to April 1, 1960, has not only been a season of consolidating the educational, institutional and public relations gains made by AES during its FIFTIETH ANNIVERSARY observance in 1958-1959 but has also been a period of progress along most directions of its mission and goal.

TODAY'S AES NETWORK OF BRANCHES

Structurally, the Society is currently composed of 58 Branches distributed 50 coast-to-coast in the United States, 5 in Canada, 3 in Australia. Recompensing loss of its former San Antonio Branch, dissolved because of emasculated plating and metal finishing activities in that community, and of its erstwhile Twin City Branch, resigned so as to recreate itself as a distinct independent metal finishing entity, the AES has chartered two fine new Branches, one in Denver, Colorado, the other in Phoenix, Arizona.

Currently operating under Temporary Charter, moreover, is its promising Memphis-Midsouth Branch that, on the basis of record to date, should certainly qualify for Permanent Charter by fiscal year-end. In such case, it will become the AES's 59th chartered Branch.

SIX REGIONAL GROUPS SERVE THE SOCIETY

So as to cultivate area educational and other AES Branch activities that lend themselves effectively to Branch collaboration regionally, the Society's area Groups or Councils have now swelled to these six, composed as follows, with a seventh, the Southwestern, in process of formation:

DIXIE GROUP
- Blue Ridge Branch
- Memphis-Midsouth Branch
- Miami Branch
- Southeastern Branch

EMPIRE STATE GROUP
- Buffalo Branch
- Capitol District Branch
- Mohawk Valley Branch
- Rochester Branch
- Southern Tier Branch
- Syracuse Branch

MIDWEST COUNCIL
- Chicago Branch
- Milwaukee Branch
- Mississippi Valley Branch
- Rockford Branch
- St. Joseph Valley Branch
- St. Louis Branch

METROPOLITAN GROUP
- Newark Branch
- New York Branch

NEW ENGLAND GROUP
- Boston Branch
- Bridgeport Branch
- Hartford Branch
- New Haven Branch
- Springfield Branch
- Waterbury Branch

TRI-STATE GROUP
- Columbus Branch
- Cincinnati Branch
- Dayton Branch
- Indianapolis Branch
- Louisville Branch

The organization meeting of the proposed Southwestern Regional Group is scheduled to be held at AES's Los Angeles Convention, July 26. If formed as expected, the new group will probably be composed of AES's Dallas-Fort Worth, Denver, Houston, Kansas City, Phoenix and Wichita Branches. Its genesis will consequently mean that well over half of the Society's chartered Branches will be associated with AES Regional Groups already formed and functioning in behalf of the Society's educational mission and goal.

RAMIFICATIONS OF AES MEMBERSHIP

The bulk of AES's large membership comprises these 58 chartered Branches. At the half-way point of the Society's 1959-1960 fiscal year on January 1, 1960, the Society's membership census disclosed a moderate decline in the number of AES Branch members, this mainly resulting from the streamlining of Branch rosters at last Autumn's Per Capita Tax Payment time by the weeding out, in many Branches, of deadwood. There has since been membership growth in many Branches, and it appears possible that the Society will close its fiscal year on June 30, 1960 with as large an Active membership, quantitatively, as at the fiscal year's beginning on July 1, 1959. Qualitatively, the Society looks for gains from the policy, particularly stressed this year, of affording each membership prospect with even more discerning screening for fitness, educational thirst and genuine interest prior to Branch election to Active membership.

And gratifying indeed has been the larger interest in AES Membership-at-Large manifested, on an international scale, by individuals seriously interested in electroplating and metal finishing knowledge residing in communities, far and near, not now served by AES chartered Branches. By fiscal year-end on June 30, 1960, there is consequent prospect that the number of such Members-at-Large can become the largest in AES history despite a moderate attrition last Autumn of Members-at-Large who dropped out because of the increase in Membership-at-Large dues from $9 per annum to $11 per annum enacted by the Supreme Society last June effective this fiscal year.

The AES's Sustaining Membership group is also increasing. Financial sustenance of the Society's vital Research Program mainly stems from these memberships supported by a large number of progressive industrial companies in the United States and Canada. As in other Associations and Societies, the recent unlamented economic recession took its toll of a number of such AES Sustaining Memberships. Due to retrenchment in many companies during this gloomy period, a number of such concerns either resigned or suspended their Sustaining Memberships. Happily, many have now been reinstated. Conspicuous, particularly, has been the constructive effort exercised by dynamic teams of many Branches not only to stimulate restoration of suspended Sustaining Memberships but also to persuade other companies within Branch areas to identify themselves with AES's cooperative research program through Sustaining Membership. Accordingly, it seems likely that the stature of AES's Sustaining Membership roster will be greater at fiscal year end on June 30, 1960 than at its start on July 1, 1959.

FINANCING OPERATIONS IN 1959-1960

Against a national economic background of widely recessed business, the Society and its PLATING MAGAZINE ended AES's GOLDEN JUBILEE year (July 1, 1958-June 30, 1959), a twelve-month period of noteworthy AES accomplishment and educational, institutional and public relations impact, with a consolidated "expense over income" deficit aggregating $20,566.00.

John P. Nichols

Paradoxically, this deficit occurred despite AES/PLATING's financial management record of operating by some $20,248.00 under its approved consolidated expense budget for that very same fiscal year.

That $20,566.00 consolidated deficit resulted, therefore, not from spending but from less revenue attained than needed and estimated by the Board for that fiscal year.

It is manifestly impossible at this stage of the 1959-1960 fiscal year to marshal a complete financial statement for the full twelve-month fiscal period ending June 30, 1960. Such a certified financial statement of AES/PLATING MAGAZINE/Research Program will, of course, be provided after audit by Clyde A. Zukswert & Co., certified public accountants, and will be published in the September 1960 issue of PLATING MAGAZINE.

The following, meantime, portrays AES/PLATING MAGAZINE operating performance during the nine-month period, July 1, 1959 through March 31, 1960, latest fiscal period for which data are available as this is written, and compares that nine-month record with the corresponding 1958-1959 period:

INCOME	1958-1959	1959-1960
Society	$ 31,594.97	$ 51,860.24
PLATING	112,095.26	121,488.78
	$143,690.23	$173,349.02
EXPENSE		
Society	$ 42,274.01	$ 56,968.98
PLATING	112,500.46	116,510.39
	$154,774.47	$173,479.37

In approving a sizably less Per Capita Tax increase, effective July 1, 1959, than had been recommended by its Sixth Interim Meeting, and with even this moderate increase (first Per Capita Tax increase enacted since 1946) applicable only to AES Branches located in Continental North America, the Supreme Society, at its Annual Meeting held in Detroit, June 18, 1959, also authorized an appropriation from the AES's General Fund to enable AES/PLATING to balance its 1959-1960 budget.

In the nine-month fiscal record foregoing, AES/PLATING show a consolidated "expense over income" deficit of $130.35 for the specified nine-month 1959-1960 period compared with an $11,084.24 consolidated "expense over income" deficit for the corresponding 1958-1959 period.

It is worth noting that the $130.35 nine-month deficit for 1959-1960 exists because AES has not yet resorted to any part, to date, of that authorized General Fund subsidy.

It might also be added that the rise in Society expense during the specified nine-month 1959-1960 period resulted from the naturally far larger cost of the AES's 400-page GOLDEN JUBILEE Edition of TECHNICAL PROCEEDINGS (1959) than the cost of the 170-page 1958 Edition. Much of that cost is being amortized, by the way, through surging sale of available extra copies of the 1959 book to AES non-members globally.

AID TO BRANCHES BENEFITS MEMBERS

In structure, the AES, in effect, can be likened to our United States. Like our respective States of the Union, AES Branches are benefitted by the stability, strength and blessings derived from cooperative unity, including National Headquarters coordination, services and prestige, and the National Society's half-century cooperative action and results in stimulating advancements in electroplating, metal finishing and allied arts through active research and educational concentration.

And in any such structure where Branches, though governed by the Society's Constitution and Bylaws, are otherwise autonomous though coordinated, each naturally reaps as it sows. The National Society provides them with aegis, opportunity, incentive, services and aid thereby enabling them to benefit greatly, under their own Branch leadership, in relation to Branch attitude, steam and performance.

Branch members have consequently benefitted from the thriving educational and other activities of AES's larger Branches in the United States, Canada and Australia, and from the expanding accomplishments of the Society's effective smaller Branches that, by performance, are growing larger. In service of Branches to their Branch members, the Branch monthly educational meeting has been a foremost medium for educational enrichment. And a valuable tool to the Branch Librarian in scheduling suitable speakers for such Branch assemblies, has been the 1959-1960 Speakers List prepared by the Speakers List Subcommittee of the Society's Educational Committee, and published and disseminated among AES Branches by National Headquarters. A helpful innovation in the 1959-1960 Speakers List was its employment of abstracts with titles thereby facilitating even more suitable selection by Branch Librarians of talks most likely to satisfy the tastes of their own specific Branches.

Branches have been assisted in membership expansion, furthermore, by the work and inspiration of AES's National Membership Committee. In their membership expansion work, they have also been aided by visual aids prepared and published by National Headquarters, including not only the widely distributed booklet, "AES Membership: Its Meaning to YOU", but also the new two-color gatefold combination membership promotion leaflet and application blank targeted to Branch membership increase.

Branches and their members have been the beneficiaries, too, of the work of the AES's Publications Committee, Public Relations Committee and other such task forces of the Society. And the National Society itself has been aided in remaining coordinated and well-functioning by such of its elements as the Law Committee, the Credentials Committee, others.

So as to recognize and reward distinguished educational accomplishment by AES members, the Society, moreover, has eight Paper Awards, including the highest for a member's paper published in PLATING MAGAZINE or TECHNICAL PROCEEDINGS, namely the Carl E. Heussner AES Gold Medal Award.

It also has the AES Scientific Achievement Award, the Society's highest scientific honor.

The Charles Henry Proctor Memorial Leadership Award, the AES's summit non-technical, non-scientific award, was created in 1959, furthermore, and will be presented, for the first time, at the Farewell Banquet of the Society's 47th Annual Convention to be held in Los Angeles on July 28, 1960.

And apex honor for the AES member, of course, is election to AES Honorary Membership, a calculatedly select circle of long-time members of the Society who have rendered conspicuously meritorious service to its goal, progress and international prestige. At present, the circle comprises thirteen living Honorary Members, with two more now endorsed for election by the Supreme Society this July.

The Society, its Branches, its members can well be proud of the zeal of AES's Paper Awards Committee, its AES Scientific Achievement Award Committee, its Proctor Award Selection Committee and its Honorary Membership Awards Committee that are mainly responsible for the selection or screening of recipients of these coveted AES honors.

PLATING MAGAZINE: ITS 50TH ANNIVERSARY

Official journal of the farflung membership of this Society—originated by its members a half-century ago and fully owned by AES—tailored to serve AES and its members, in all ramifications—PLATING MAGAZINE is produced monthly by publishing professionals of long standing. Technically and scientifically, these publishing practitioners are bolstered by a qualified Editorial Board composed of scientific and technical experts. The focussed teamwork resulting has enabled PLATING MAGAZINE to gain international prestige and reputation. One international stalwart labeled its GOLDEN JUBILEE ISSUE (June 1959) as the finest magazine edition published in the plating and finishing field, here or abroad, during his long career.

With the dawn of 1960, AES reached another milestone in its history, namely the FIFTIETH ANNIVERSARY of its PLATING MAGAZINE. The event was appropriately marked by the publishing in January 1960 of PLATING's own FIFTIETH ANNIVERSARY ISSUE which too earned international notice.

From humblest beginnings, PLATING MAGAZINE today enjoys the largest audited paid circulation in its field. The constancy of its readership, particularly among a large and growing number of AES non-members who spontaneously purchase annual subscriptions at the rate of $5 domestic or $8 foreign, is corroborated by the highest audited paid subscription renewal percentage in this field.

PLATING is a member of the Audit Bureau of Circulations and of the Society of Business Magazine Editors. It is indexed in Applied Science and Technology Index, and, to name a few, is abstracted regularly in Chemical Abstracts, Metals Review, Metallurgical Abstracts, Engineering Abstracts, Engineering Index, Technical Data Index and Bulletin Analytique.

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REMINISCENCES OF AES's GOLDEN JUBILEE CONVENTION, DETROIT 1959

PLATING'S FIFTIETH ANNIVERSARY ISSUE

Above, the cover of PLATING MAGAZINE's well-received ANNIVERSARY ISSUE marking the magazine's own Golden Jubilee. It had international distribution.

AES's COOPERATIVE RESEARCH PROGRAM

Under the direction of a seasoned Research Committee, implemented by an effective network of supervisory echelons, the AES's Research Program in universities and foundations here and in Canada had a worthy 1959-1960 fiscal year of performance as detailed elsewhere in this Annual Report by James D. Thomas, its Chairman.

Apart from your National Executive Secretary's service as Secretary-Treasurer of that program, National Headquarters played a large role in the dissemination of research information during the year, particularly in the editing and publishing by Rodney Leeds, AES's able editor, and Thomas W. Lowe, its production expert, of Serial Report Numbers 40 through 44 embodying specific results of AES research. And widely used during the fiscal year was the membership promotion booklet focused upon prospective Sustaining Members titled, "Is Advancement in Electroplating and Metal Finishing Important to YOUR Company's Future?" created in the recent past by the National Office.

FIRST CONVENTION WEST OF THE MISSISSIPPI

Among the many tools for self-betterment provided to its members by the AES and its 58 Branches and six Regional Councils or Groups is a well-planned, popularly priced, versatile, four-day Annual Convention. On the heels of the Society's mammoth GOLDEN JUBILEE Convention and Industrial Finishing Exposition, including the memorable Fifth International Conference on Electrodeposition and Metal Finishing, concurrently held in Detroit, Michigan, June 15-19, 1959 with the outstanding Detroit Branch as Host, the Society, this year, will conduct its 47th Annual Convention in Los Angeles, California, July 24-28, 1960, representing the first time that an AES National Convention has ever been held west of the Mississippi River.

Featuring an educational program of significance, including a two-session "Hydrogen Embrittlement in Metal Finishing Symposium", the Los Angeles Convention will offer an impressive complement, too, of fellowship and fun, especially for the ladies and for the youth of AES. The Society has already been warmly greeted by Governor Edmund G. Brown of California. Mayor Norris Poulson has already promulgated a Proclamation declaring the week of July 24-28 as "American Electroplaters' Society Week in Los Angeles".

As with last year's Detroit Convention and its predecessors, the 47th Annual Convention is an example of effective cooperation among an enthused Host Branch—an industrious Convention Committee ably led by General Convention Chairman Tony Stabile—a diligent Editorial Board that provided seasoned supervision and direction to the fashioning of educational sessions—and, finally, National Headquarters that not only conceived, wrote, designed and published all Convention promotion and publicity material given international attention through its PLATING MAGAZINE but which also extended other specialized assistance to the Convention and its leadership.

HEADQUARTER'S IN AES's FIFTY-FIRST YEAR

Aside from its normal publishing, public relations and other diverse activities in behalf of the Society, the coordination and servicing of AES's 58 American, Canadian and Australian Branches so as, in turn, to aid them in conducting effective educational and other programs beneficial to Branch members was a consistently stressed and further developed Headquarters' function in 1959-1960. In addition, the National Office continued, of course, to serve the needs of AES's growing ranks of Members-at-Large and Sustaining Members.

Apart from day-to-day correspondence, communications and other routine elements of its complex duties, Headquarters created and distributed among AES Delegates, Committees, Branches, advertisers, subscribers, non-members interested in AES membership or others, some 130 pinpointed bulk mails filling nearly 40,000 envelopes or other mailing containers, in the nine-month period from July 1, 1959 to April 1, 1960.

A copy of the GOLDEN JUBILEE ISSUE of PLATING MAGAZINE, beyond usual copies issued to PLATING's large international circulation, was presented to the library of every American and Canadian college and university for the use of its scientific faculty and student body, and these were well-received.

Beside large international distribution to a specially prepared list, the AES's FIFTIETH ANNIVERSARY documentary booklet, "Milestones of AES", including its mainstay chart, "Kaleidoscope of AES's First Half-Century", was further disseminated among 500 libraries and other key educational centers.

Moreover, several thousand AES non-members who had either attended the AES's GOLDEN JUBILEE Convention, Exposition or International Conference in Detroit in June 1959 were reached by direct mail with Convention, Exposition and International Conference literature shortly after those Detroit events, and were invited to consider Active, Member-at-Large or Sustaining Membership or PLATING subscription or advertising.

BROADER PUBLISHING PROGRAM LAUNCHED

Since the start of the current fiscal year, furthermore, AES has embarked upon a substantially broadened book publishing program.

As already reported, its GOLDEN JUBILEE EDITION of TECHNICAL PROCEEDINGS (1959) containing each of the 43 technical papers delivered before the Fifth International Conference on Electrodeposition and Metal Finishing, including the transcript of the discussion that attended the delivery of each such paper, has had impressive global reception. Not only are extra copies of that book being widely purchased internationally but quantities of reprints of respective articles embodied in the book are also in wide demand. About the book itself, the head of the Association Division of the U. S. Department of Commerce wrote:

> "Regarding your 400-page GOLDEN JUBILEE EDITION of TECHNICAL PROCEEDINGS received this week, I want to hasten to state—What a whale

THE 1959-1960 EXECUTIVE BOARD

Clockwise from lower left: Past President Herberth E. Head, National Executive Secretary John P. Nichols, National President Ralph D. Wysong, First Vice President W. Andrew Wesley, Second Vice President Chester G. Borlet and Third Vice President Manuel Ben.

of a job . . . How useful this will be, throughout the world, to the countless persons concerned with electroplating and metal finishing.

"We have records in this part of the U. S. Department of Commerce of some 5,000 national associations, societies, etc. Your volume is one of the finest reports of its type which we have had the pleasure of seeing, prepared by an association."

The Executive Board also empowered your National President and your National Executive Secretary to enter the AES into a contract with a leading scientific book publishing company by which said publisher will publish, in book form, the technical papers to be delivered by experts before the AES's "Hydrogen Embrittlement in Metal Finishing Symposium" at the 1960 Los Angeles national convention, after said papers have first appeared in the AES's book, TECHNICAL PROCEEDINGS (1960 Edition).

The book, now contracted, will not only include the delivered hydrogen embrittlement papers themselves, and the transcript of the discussion that will attend the delivery of each such paper, but will also be supplemented by additional data on hydrogen embrittlement being marshaled by Dr. Harold J. Read, Professor of Physical Metallurgy, Pennsylvania State University, AES Editor of that special AES book.

It is contemplated, moreover, to publish, similarly, the papers that will be delivered before a projected "Finishing of Light Metals Symposium" at the Boston Convention in June 1961, after those papers have first appeared, of course, in the 1961 Edition of the AES's book, TECHNICAL PROCEEDINGS.

Your National President and your National Executive Secretary were empowered by the Executive Board, furthermore, and did enter the AES into a contract with another scientific publishing company to publish a reprint edition of the AES book, "Fundamentals of Electrochemistry and Electrodeposition" by Dr. Samuel Glasstone, that was initially published and copyrighted by the Society in 1943. Containing a new Foreword by Dr. Glasstone, the up-to-date little book is expected to make its appearance early this Summer.

PERSONAL CONTACT WITH AES BRANCHES

All six National Officers shared during the fiscal year since July 1, 1959 in the pleasant duty of visiting AES Branches and Regions. Though the demands of National Headquarters, PLATING MAGAZINE, the Research Program, Executive Board and other AES business, public relations and publishing affairs, necessarily limited his Branch itinerary, this writer nonetheless managed, happily, to visit a number of Branches during the year. Among events addressed were the "Aerospace Finishing Symposium" banquet in Fort Worth, Texas, in December, and the Dixie Regional Meeting banquet in Miami Beach, Florida, in January.

With National President Ralph D. Wysong, he composed the National Officer team that installed the new Phoenix Branch at a gala event in Scottsdale, Arizona, on October 9, 1959 and the new Denver Branch, in Denver, October 13. He is scheduled to attend the Tri-State Regional Meeting in Cincinnati, April 23 and the Empire State Regional Meeting in Elmira, N. Y. April 29. He will then make a flying West Coast Branch tour addressing, on successive nights in early May, the British Columbia Branch in Vancouver, the Seattle-Puget Sound Branch in Seattle, the Portland Branch, the San Francisco Branch, then the Los Angeles Branch where he will also aid in finalizing Convention business.

COOPERATION WITH OTHER ASSOCIATIONS

Years ago, AES recognized the worth and significance of cooperation, and today its relationship of mutuality with other technical, scientific and professional Associations and Societies in matters of common interest, and with others dealing with it, is among the Society's most-prized assets. National Headquarters and some fifteen AES liaison representatives are working with such Associations and Societies.

Good private relations are the very essence of good public relations. And as Abraham Lincoln said, "With public sentiment nothing can fail; without it nothing can succeed."

IN CONCLUSION

In recapitulating, to date, this fiscal year of maximum performance while building, it can be reported that the American Electroplaters' Society experienced continued progress from practically every standpoint.

The Society proudly received a testimonial of commendation from the American Society of Association Executives which, with respect to citing AES's 1959 activities, said:

"This achievement, made possible by the creative effort of its dedicated members and staff, represents a unique and outstanding contribution to association management, which is highly deserving and well earned. In recognition of this superior effort in the public service and to your industry in the year 1959, we set our hand and seal."

Any and all AES progress is, of course, the collaborative handiwork of many AES elements, including the Supreme Society; the Executive Board; Branches and Branch leadership; Standing and Special Committees; PLATING MAGAZINE and Convention paper authors; members, individually and collectively, here and abroad—plus, of course, the dedicated staff at Headquarters that demonstrated itself notably by the quality and quantity of its output.

To all the aforementioned, AES congratulations are in order for a generally good year. And to staff, the same congratulations—but with a very special and proud "thank you."

Typical 1959–1960 Committee Meetings. (1) The Editorial Board, (2) The Research Committee, (3) The Educational Committee and (4) The Membership Committee.

RESEARCH CHAIRMAN'S REPORT

by

JAMES D. THOMAS

THE Research Program of the American Electroplaters' Society (AES) is becoming more important in view of the changes taking place to improve the quality of plated parts. The improvements require basic studies of the various aspects of electrodeposition. The work of the various projects is expected to supplement that of others for the benefit of the entire plating industry.

GENERAL

Seven projects were continued this past year. One, Project 17 on "Microthrowing Power," will be terminated on June 30, 1960. One or two new projects will probably be started during the next fiscal year.

The economic recession has shown good recovery and is reflected in an increased number of sustaining members, both new and reinstated.

PUBLICATIONS

Serial Report No. 40, Project 13 studies on "The Nature, Cause and Effect of Porosity in Electrodeposits," and Serial Report No. 41, Project 16 studies on "Mechanism of Electrodeposition," have been published. Three more are being processed and will be issued soon.

The 1959 Technical Proceedings contains papers pertaining to Projects 14 (page 113), 15 (pages 149 and 159), and 17 (page 50).

PRESENT STATUS OF RESEARCH PROJECTS

PROJECT 12—Cleaning and Preparation of Metals for Electroplating

Laboratory work is beginning on studies of the effect of soils on overpotential and the kinetics of electrodeposition of metals. These studies are expected to shed light on the cleanliness requirements of work prior to plating.

PROJECT 13—Nature, Cause and Effect of Porosity in Electrodeposits

Preliminary experiments in which static potentials, short-circuit potentials, and short-circuit currents of nickel-iron and chromium-nickel couples were measured in various electrolytes have been carried out.

Dr. D. Ernst has resigned as Fellow on this project and a final report will be prepared on this work. The project is inactive at present.

PROJECT 14—The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating

The present studies are concerned with the observation of events which predispose and accompany the formation of electrodeposits. Direct microscopic observations of the nucleation pattern and subsequent deposit growth will be evaluated in relation to corrosion behavior. Preliminary observations of chromium deposited on grain-oriented silicon steel show promise.

PROJECT 15—Accelerated Corrosion Tests

A report is being prepared which will detail the recommended procedures for operation of the CASS and Corrodkote tests. Reproducibility of test results is achieved when the tests are operated according to specifications.

PROJECT 16—Mechanism of Electrodeposition

Dr. Enyo has completed his work and has been replaced by Mr. Kita who will continue studies of mechanism of deposition of copper from sulfate solutions.

PROJECT 17—Microthrowing Power

On the theoretical aspects, equations have been proposed by Dr. Wagner on primary and secondary current distributions for the profile of the cathode studied. These theoretical equations are being tested with data available.

James D. Thomas

PROJECT 18—Mechanical Finishing of Metal Surfaces

Some new approaches are being considered to determine what happens under a buffing wheel. A report of the studies on types of buffs, wheel speeds, and buff wear is being prepared for publication.

FUTURE PLANS

With an upward trend in sustaining memberships, the prospects of starting new projects are encouraging. Several areas of interest, compiled by the Subcommittee on New Projects, are being considered on the basis of benefits to be derived by the most people.

ACKNOWLEDGMENTS

The bright future of AES Research is the result of the efforts of the Research Committee, those directly associated with the project guidance, and the Branch members who promoted the improved sustaining membership picture. The Chairman appreciates the efforts of each one of these people who helped make this a successful year for the AES Research Program.

Special thanks are due to the Sustaining Members; without their faith in this work, the Society could not continue to sponsor this vital program.

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1926–1929	R. J. O'Connor
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1949–1950	William M. Tucker
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1951–1952	G. M. Cole (Died Aug. '51) Dr. Donald Price
1952–1953	Dr. Donald Price
1953–1954	Dr. Earl J. Serfass
1954–1955	Dr. Earl J. Serfass
1955–1956	Leslie C. Borchert
1956–1957	Arthur H. DuRose
1957–1958	Robert A. Ehrhardt
1958–1959	Dr. Russel E. Harr
1959–1960	James D. Thomas

SUMMARY OF AMERICAN ELECTROPLATERS' SOCIETY RESEARCH PROJECTS 1959-1960

Project	Location	Project Director	Committee Chairman	Fellow	Subject	Status
12	Columbia University	Dr. H. B. Linford	E. T. Candee	J. Desmond Wm. P. Brown J. Grunwald	Cleaning—Oxide Effects	Active
13	Bureau of Standards	Fielding Ogburn	C. H. Sample	Dr. D. Ernst W. H. Roberts	Nature, Cause, and Effect of Porosity in Electrodeposits	Active
14	Ontario Research Foundation	Dr. M. H. Jones	W. M. Tucker	J. Zajdowski	Effect of Basis Metal Conditions on Plating	Active
15	Detroit Area	None	W. L. Pinner	None needed	Accelerated Corrosion Tests	Active
16	University of Pennsylvania	Dr. J. O'M. Bockris	E. Bowerman	Mr. Enyo	Mechanism of Electrodeposition	Active
17	Virginia Institute for Scientific Research	Dr. H. Leidheiser Jr.	A. H. DuRose	Lucille B. Garmon	Microthrowing Power	Active
18	Chicago Area	W. C. Geissman	R. S. Modjeska	G. Nausner K. Gatchel	Mechanical Finishing of Metal Surfaces	Active

Dr. William Blum
Honorary Member

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Vice Chairman
Research

James D. Thomas
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Member

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BRANCH DELEGATES COMPOSING THE SUPREME SOCIETY

The AES's highest governing council, known as "Supreme Society" is composed of three duly elected Delegates from each of the 58 chartered AES Branches. Accredited by the Credentials Committee, these Delegates, as a body, were the governors and lawmakers of this Society in its fifty-first year (1959-1960).

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IRVIN M. WEISS, The Metal & Thermit Corp.
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BRUCE A. LESLIE, Victoria, Australia (Consultant)
KERGAN WELLS, W. W. Wells, Ltd., (Research Committee Liaison)

PAPER AWARDS COMMITTEE

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DR. HENRY BROWN, The Udylite Corporation
CLARENCE H. SAMPLE, International Nickel Co.

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FRANCIS T. EDDY, TELautograph Corporation
DR. VERNON A. LAMB, National Bureau of Standards
R. SCOTT MODJESKA, Scientific Control Laboratories
DR. JOSEPH V. PETROCELLI, International Nickel Co.
W. WALLACE SELLERS, International Nickel Co.
DR. EARL J. SERFASS, Milton Roy Co.
PAUL A. WAALKES, Hanson-Van Winkle-Munning Co.
DR. HAROLD J. WIESNER, Bendix Aviation Co.

PUBLIC RELATIONS COMMITTEE

ROBERT M. NORTON, Hanson-Van Winkle-Munning Co., *Chairman*
EUGENE ROTH, Roth Plating Corporation, *Vice Chairman*
JOHN P. NICHOLS, American Electroplaters' Society, Inc., *Secretary-Treasurer*
I. WILLIAM MARCOVITCH, American Machine & Metals, Inc.
H. J. MCCRACKEN, Northwest Chemical Company
ARTHUR G. PIERDON, Art Metal Finishing Co.
MORGAN D. RAKE, International Business Machines Co.
KENNETH G. REIFSTECK, General Electric Company
HERMAN A. TESSMAN, Allen-Bradley Company
FRANK TIRENDI, Patent Button Co.

CHARLES HENRY PROCTOR MEMORIAL LEADERSHIP AWARD

RALPH D. WYSONG, President, American Electroplaters' Society, Inc., *Chairman*
MRS. RUEBE PROCTOR PRESTON, Donor
MR. WILLIAM O. PRESTON, Donor
ROLLAND E. CAMPBELL, Proto Tool Company
DR. SAMUEL HEIMAN, Philadelphia Rust Proof Company
JAMES LEE, Mackenzie & Feimann Ltd.
JOHN P. NICHOLS, American Electroplaters' Society, Inc.
JAMES D. THOMAS, General Motors Corporation

RESEARCH COMMITTEE

James D. Thomas, General Motors Corp., *Chairman*
Kergan Wells, W. W. Wells, Ltd., *Vice-Chairman* (Finance)
Dr. D. Gardner Foulke, Sel-Rex Corp., *Vice Chairman* (Research)
John P. Nichols, American Electroplaters' Society, Inc., *Secretary-Treasurer*
Dr. William Blum, *Consultant*
Glade B. Bowman, Rockwell-Standard Corp.
Richard A. Fellows, The Udylite Corp.
Edward J. Kubis, Wyandotte Chemicals Corp.
Raymond L. Mitchell, Mitchell-Bate Co.
Walter E. Moline, National Cash Register Co.
Clarence H. Sample, International Nickel Co.
Dr. Harold J. Wiesner, Bendix Aviation Co.

SCIENTIFIC ACHIEVEMENT AWARD COMMITTEE

Dr. Henry B. Linford, Columbia University, *Chairman*
Dr. Abner Brenner, National Bureau of Standards,
Myron B. Diggin, Hanson-Van Winkle-Munning Co.
Dr. Russel E. Harr, Western Electric Co.
Dr. Louis Weisberg, *Consultant*
Dr. Harold J. Wiesner, Bendix Aviation Corp.

1959-1960
AES LIAISON REPRESENTATIVES WITH OTHER SOCIETIES

1. American Society for Testing Materials (ASTM)
   John P. Nichols, American Electroplaters' Society, Inc.

   ASTM Committee A-5, Corrosion of Iron and Steel
   August Mendizza, Bell Telephone Laboratories, Inc.

   ASTM Committee B-8, Electrodeposited Metallic Coatings
   Donald M. Bigge, Chrysler Corporation

   ASTM Committee D-19, Industrial Water
   Henry Kafarski, Chemical Processing Co.

   ASTM Committee B-7, Sub-Committee VI on the Anodic Oxidation of Aluminum and Magnesium Alloys
   Russell V. VandenBerg, Aluminum Company of America

2. American Standards Association (ASA) Committee Z-74 Performance of Effluent Air and Gas Cleaning Equipment
   George Schore, Brucar Equipment & Supply Company
   ASA Committee Z-9, Sectional Committee on Safety Codes for Exhaust Systems
   W. R. Fidelius, Hanson-Van Winkle-Munning Co.

3. International Council on Electrodeposition & Metal Finishing
   Walter L. Pinner, The McGean Chemical Co., (Chairman)
   Dr. Richard B. Saltonstall, The Udylite Corporation
   Dr. Walter R. Meyer, Enthone, Inc.
   Myron B. Diggin, Hanson-Van Winkle-Munning Co.

4. Inter-Society Corrosion Committee
   George E. Best, Manufacturing Chemists' Association

5. Metal Finishing Suppliers' Association
   Dr. Henry L. Kellner, Lea Manufacturing Co.

6. National Association of Corrosion Engineers
   George E. Best, Manufacturing Chemists' Association

7. National Association of Metal Finishers
   Arthur G. Pierdon, Art Metal Finishing Company

8. National Technical Task Committee on Industrial Wastes
   Dr. D. Gardner Foulke, Sel-Rex Corporation

9. Ohio River Valley Sanitation Commission
   William J. Neill, Columbus Metal Products, Inc.

10. Society of Plastics Engineers
    Fremont L. Scott, The Metal & Thermit Corp.

11. Society of Aircraft Materials & Process Engineers
    Myron E. Browning, The Convair Company

BRANCH DIRECTORY*

(As at April 1, 1960)

ADELAIDE

Secretary-Treasurer: R. J. Down
13 Sedgeford Rd., Myrtle Bank, South Australia
Meeting Place: 17 Waymouth St., Adelaide
Day of Month: Various
Time: 6:00 P.M.

Sustaining Members:
None

ALLENTOWN-READING

Secretary-Treasurer: John B. Ernst
1531 "B" Liberty St., Easton, Pa.
Meeting Place: Scotty's Anchorage, Emmaus, Pa.
Day of Month: Fourth Thursday
Time: Dinner 7:30 P.M.

Sustaining Members:
Bethlehem Steel Co. (2), Bethlehem, Pa.
L. F. Grammes & Sons, Inc., Allentown, Pa.
The New Jersey Zinc Co. (of Pennsylvania), Palmerton, Pa.

BALTIMORE-WASHINGTON

Secretary: Edward J. Roach
1601 Woodbourne Ave., Baltimore 12, Maryland
Meeting Place: Chemistry Bldg., National Bureau of Standards, Washington 25, D. C.
and
The Regent House Hotel, Baltimore, Md.
Day of Month: Second Tuesday
Time: 8:00 P.M.

Sustaining Members:
Allied Research Products, Inc., Baltimore 5, Md.
American Instrument Co. Inc., Silver Spring, Md
E. I. duPont de Nemours & Co., Inc., Wilmington 98, Del.

BLUE RIDGE

Secretary-Treasurer: Donald H. McGee
3045 Gilmer Ave., Winston-Salem, N. C.
Meeting Place: Roanoke, Blacksburg, Blue View, Winston-Salem, Lynchburg, Carlton Terrace
Day of Month: First Friday
Time: 6:30 P.M.

BOSTON

Secretary-Treasurer: Dr. George P. Swift
53 Galen St., Watertown 72, Mass.
Meeting Place: Hotel Statler, Boston, Mass.
Day of Month: First Thursday
Time: Dinner 6:00 P.M.—Meeting—8:00 P.M.

Sustaining Members:
M. E. Baker Co., Cambridge, Mass.
Beacon Supply Co., Chelsea, Mass.
F. L. & J. C. Codman Co., Rockland, Mass.
United-Carr Fastener Corp., Cambridge 42, Mass.

BRIDGEPORT

Secretary-Treasurer: Robert G. Parker
25 Beverly Rd., Trumbull 58, Conn.
Meeting Place: Hotel Barnum, Bridgeport, Conn.
Day of Month: Second Friday
Time: 8:00 P.M.

Sustaining Members:
Barrett Chemical Products Co., Shelton, Conn.
Electrolux Corp., Old Greenwich, Conn.
Mitchell-Bradford Chemical Co., Bridgeport, Conn.
Roberts Rouge Co., Stratford, Conn.
E. E. Seeley Co., Inc., Bridgeport, Conn.
Yankee Metal Products Corp., Norwalk, Conn.

BRITISH COLUMBIA

Secretary: Douglas A. Armstong
10316-124A Street, North Surrey, B.C.
Meeting Place: White Spot Barbecue, 25 & Cambie St. Vancouver, B. C.
Day of Month: 3rd Wednesday of Month
Time: 6:30 P.M.

BUFFALO

Secretary: Robert E. Lienert
44 Fancher Ave., Buffalo 23, N. Y.
Meeting Place: Niagara Manor, 899 Niagara Falls Blvd., Buffalo, N. Y.
Day of Month: 1st Friday
Time: 6:30 P.M. Dinner—Meeting 8:00 P.M.

Sustaining Members:
Van Der Horst Corporation of America, Olean, N. Y.

CAPITOL DISTRICT

Secretary: Edward O. Legere
100 Skyway Drive, Scotia, N. Y.
Meeting Place: Hot Shoppe, Albany, N. Y.
Day of Month: First Monday
Time: 7:00 P.M.

Sustaining Members:
Sprague Electric Co. North Adams, Mass.

CENTRAL MICHIGAN

Secretary-Treasurer: R. W. Boos
2400 E. Mt. Hope, Okemus, Michigan
Meeting Place: Roosevelt Hotel, Lansing, Mich.
and
Hayes Hotel, Jackson, Mich.
Day of Month: First Tuesday
Time: 7:00 P.M. (Dinner Meeting)

Sustaining Members:
None

CHICAGO

Secretary-Treasurer: Paul Glab
882 N. Paulina St., Chicago 22, Ill.
Meeting Place: Stella's Restaurant, 3206 N. Kostner Ave., Chicago, Ill.
Day of Month: 2nd Friday of each Month
Time: Dinner 6:15—Meeting 7:15

Sustaining Members:
Acid Products Co., Inc., Chicago, Ill.
Allied Industrial Products, Inc., Chicago, Ill.
American Can Co., Maywood, Ill.
American Nickeloid Co., Peru, Ill.
Amerock Corporation, Rockford, Ill.
Amphenol Borg Electronics Corporation, Chicago 50, Ill.
Apex Plating Co , Chicago 7, Ill
Apollo Metal Works, Chicago 38, Ill
Ardco, Inc , Chicago 38, Ill.
Arrow Plating Co., Inc., Chicago 47, Ill.
Atlas Plating Works, Cicero 50, Ill.
Bastian Blessing Co., Chicago 30, Ill.
Belke Mfg. Co., Chicago, Ill.
Bell & Howell Co., Chicago 45, Ill.
Berteau-Lowell Plating Works, Chicago 47, Ill.
G. S. Blakeslee & Co., Cicero, Ill.
Chicago Electroplaters' Institute, Chicago 1, Ill.
Chicago Roller Skate Co., Chicago 24, Ill.
The Clinton Co., Chicago, Ill.
Cronome, Inc., Chicago 13, Ill.
Crown Rheostat & Supply Co., Elk Grove Village, Ill.
The Diversey Corp., Chicago 13, Ill.
Duro Chrome of Chicago, Inc., Chicago 12, Ill.
Ekco Products Co., Chicago 39, Ill.
Electro-Glo Co., Chicago, Ill.
Felt & Tarrent Mfg. Co., Chicago 22, Ill.
General American Trans. Corp., Kanigen Div., Chicago 90, Ill.
Graham Plating Works, Chicago, Ill.
The C. P. Hall Co. of Illinois, Chicago, Illinois
Hardwood Line Mfg. Co., Chicago 47, Ill.
Industrial Filter & Pump Mfg. Co., Chicago 50, Ill.
Kaynide Div., Kraft Chemical Co., Chicago 8, Ill.
Kelite Corporation, Los Angeles, Calif.
Kocour Co., Chicago 32, Ill.
R. Lavin & Sons, Inc., Chicago 23, Ill.
Charles F. L'Hommedieu & Sons, Inc., Chicago 23, Ill.
M-W Laboratories, Inc., Chicago 47, Ill.
The Matchless Metal Polish Co., Chicago, Ill.
The Meaker Co., Chicago 50, Ill.
Mechanical Plating Co., Chicago 22, Ill.
Mercil Plating Equipment Co., Chicago, Ill.
B. Mercil & Sons Plating Co., Chicago 12, Ill.
Metalcraft Corp., Chicago 10, Ill.
Metalwash Machinery Corp., Barrington, Ill.
The Modern Plating Co., Chicago 18, Ill.
Modern Plating Corp., Freeport, Ill.
G. J. Nikolas & Co., Inc., Bellwood, Ill.
Northwestern Plating Works, Chicago 23, Ill.
Platers Technical Service, Inc., Chicago 5, Ill.
Plating Service Co., Chicago 39, Ill.

* Numbers after names of Sustaining Members indicate number of memberships supported. This Directory is as of April 1, 1960.

Precision Electroplating Co., Chicago, Ill.
Poor & Company, Promet Division, Waukegan, Ill.
Reliable Plating Corp., Chicago 7, Ill.
Reliable Plating Rack Co., Schiller Park, Ill.
Scientific Control Laboratories, Chicago 23, Ill.
Sparkler Mfg. Co., Mundelein, Ill
Standard Plating Rack Company, Chicago 22, Ill.
The Stutz Company, Chicago, Ill.
Sunbeam Corp., Chicago 50, Ill.
Technic, Inc., Chicago 26, Ill.
Time Chemical, Inc., Chicago 32, Ill.
United Manufacturing Co., Chicago 18, Ill.
Van Straaten Chemical Co., Chicago, Ill.
Western Electric Co., Inc., Chicago 23, Ill.
Western Rust-Proof Co., Chicago, Ill.

CINCINNATI

Secretary: David L. Kaplan
817 Sabino Court, Cincinnati 31, Ohio
Meeting Place: Engineering Society Headquarters, Cincinnati
Day of Month: Fourth Wednesday
Time: Dinner 6:30 P.M.—Meeting 7:30 P.M.
Sustaining Members:
Products Finishing, Cincinnati, Ohio

CLEVELAND

Secretary-Treasurer: James K. Long
1945 E. 97th St., Cleveland 6, Ohio
Meeting Place: Cleveland Engineering Societies' Building
Day of Month: First Friday
Time: 8:00 P.M.
Sustaining Members:
Acme Plating Co., Cleveland, Ohio
Advance Plating Co., Cleveland, Ohio
Cowles Chemical Co., Cleveland, Ohio
Diamond Alkali Co., Chromium Chemicals Division, Cleveland 14, Ohio
Eaton Manufacturing Co., Cleveland 10, Ohio
Harshaw Chemical Co. (2), Cleveland, Ohio
Heil Process Equipment Corporation, Cleveland 11, Ohio
R. O. Hull & Co., Inc., Rocky River 16, Ohio
Incar, Inc., Cleveland 14, Ohio
The Kelly Plating Company, Cleveland, Ohio
Lorence Plating Co., Cleveland 4, Ohio
The McGean Chemical Co., Cleveland 9, Ohio
Pittsburgh Steel Co., Thomas Strip Div., Warren 14, Ohio
Platers Supply Co., Cleveland 14, Ohio
Republic Steel Corp., Cleveland, Ohio
Rockwell-Standard Corp., Newton Falls, Ohio
Talon, Inc., Meadville, Pa.
True Temper Corporation, Geneva, Ohio

COLUMBUS

Secretary: Leslie D. McGraw
3308 Sciotangy, Columbus, Ohio
Meeting Place: Battelle Memorial Institute, Columbus, Ohio
Day of Month: First Friday
Time: 8:00 P.M.
Sustaining Members:
None

DALLAS-FORT WORTH

Secretary-Treasurer: A. C. Fricke
212 Julian St., Dallas 3, Texas
Meeting Place: Zodiac Room, Crossroads Rest., Lennox Hotel, Grand Prairie, Texas
Day of Month: Third Wednesday
Time: 6:30 P.M.—Dinner—8:00 P.M.—Meeting
Sustaining Members:
Lane Plating Works, Dallas, Texas

DAYTON

Secretary Richard M. Clinehens
3206 Harwood St., Dayton 20, Ohio
Meeting Place: Hotel Dayton-Biltmore, Dayton, Ohio
Day of Month: Third Wednesday
Time: 8:00 P.M.
Sustaining Members:
Dayton Rust Proof Co., Dayton, Ohio
National Cash Register Co., Dayton, Ohio
Rack Processing Co., Dayton 9, Ohio
Rawac Plating Co., Springfield, Ohio

DENVER

Secretary: Elmer A. Schuster
8540 No. Essex St., Denver, Colo.
Meeting Place: Oxford Hotel

DETROIT

Secretary-Treasurer: Guy Cummings Jr.
1800-18th St., Detroit Mich.
Meeting Place: Hotel Statler, Detroit, Mich.
Day of Month: First Friday
Time: 8:00 P.M.
Sustaining Members:
Auto City Plating Co., Detroit 17, Mich.
Benchmark, Inc., Wyandotte, Mich.
Bruce Products Corp., Howell, Mich.
Buckingham Products Co., Detroit 27, Mich.
Chrysler Corp. (2), Detroit, Mich.
Congress Die Casting Div. (Tann Corporation), Detroit 34, Mich.
Detrex Chemical Industries, Inc., Detroit 32, Mich.
Douglas & Lomen Co., Detroit 8, Mich.
Ford Motor Co. (5), Dearborn, Mich.
Formax Manufacturing Corp., Detroit, Mich.
General Motors Corporation, Research Staff (5), Detroit 2, Mich.
Grand Steel & Mfg. Co., Clawson, Mich.
C. M. Hall Lamp Company, Detroit 7, Mich.
Harshaw Chemical Co., Detroit, Mich.
Heatbath Corp., Detroit, Mich.
Higgins Rack Coating & Mfg. Co., Warren, Mich.
Hoover Ball & Bearing Co., Saline, Mich.
Houdaille Industries, Inc., Detroit, Mich.
Howard Plating Industries, Inc., Royal Oak, Mich.
Kayber, Inc., Birmingham, Mich.
King-Seeley Corporation, Ann Arbor, Mich.
Lyon, Inc., Detroit 28, Mich.
Metal Plating Corp., Oak Park, Mich.
Metal & Thermit Corp., New York, N. Y.
Midwest Chrome Process Co., Detroit 9, Mich.
Michigan Chrome & Chemical Co., Detroit, Mich.
George L. Nankervis Co., Detroit 27, Mich.
Nelson Chemicals Co., Detroit 27, Mich.
Northwest Chemical Co., Detroit 4, Mich.
Oakman Manufacturing Co., Van Dyke, Mich.
Parker Rust Proof Co., Detroit 11, Mich.
Plating Inst. of Michigan, Lincoln Park, Mich.
Pillsbury Chemicals, Detroit, Mich.
Reilly Plating Company, Melvindale, Mich.
Seco Chemicals, Inc., Detroit 10, Mich.
J. J. Siefen Co., Detroit 9, Mich.
Siefen Compounds, Inc., Detroit 38, Mich.
Solventol Chemical Products, Inc., Detroit 3, Mich
Frederic B. Stevens, Inc. (2), Detroit 16, Mich.
Superior Polishing Company, Van Dyke, Mich.
Trilex Corporation, Wayne, Mich.
The Udylite Corp. (3), Detroit 11, Mich.
United Platers, Inc., Detroit, Mich.
Univertical Corporation (5), Detroit, Mich.
Wagner Division of Allied Research Products, Inc., Detroit 3, Mich.
Whitfield Chemical Co., Detroit, Mich.
Willow Run Rubber & Lining Co., Belleville, Mich.
Wyandotte Chemicals Corp., Wyandotte, Mich.

GRAND RAPIDS

Secretary: C. J. Byrns Jr.
1231 Fay Road, N.W., Grand Rapids, Mich.
Meeting Place: Scotties Restaurant-"Trader Room"
Day of Month: Second Friday
Time: 7:00 P.M.
Sustaining Members:
Abrado Finish Corporation, Grand Rapids, Mich.
Ainsworth-Precision Castings Co., Chicago 48, Ill.
Automatic Music, Inc., Grand Rapids, Mich.
Doehler-Jarvis Division of National Lead Company, Grand Rapids, Mich.
Expert Coating Co., Grand Rapids, Mich.
P. B. Gust & Company, Grand Rapids, Mich.
Grand Rapids Plating Co., Inc., Grand Rapids 5, Mich.
Grand Rapids Brass Co., Grand Rapids, Mich.
Hammond Machinery Builders, Inc., Kalamazoo, Mich
Hanson-Van Winkle-Munning Co., (formerly J. C. Miller Division) Matawan, N. J.
Haviland Products Company, Grand Rapids, Mich.
Jervis Corporation, Grandville, Michigan
Keeler Brass Co., Grand Rapids, Mich.
Knape & Vogt Mfg. Co., Grand Rapids, Mich.
Michigan Plating and Stamping Co., Grand Rapids 2, Mich.
Preston Products Co., Grand Rapids 4, Mich.
Roto-Finish Company, Kalamazoo, Mich
Seaway Plating Co., Inc., Holland, Mich.
G. H. Walgren Company, Grand Rapids 3, Mich.

HAMILTON

Secretary: C. Ross MacLeod
40 W. 3rd St., Hamilton, Ontario, Canada
Meeting Place: Scotties Restaurant-"Trader Room"
Day of Month: Third Friday
Time: 8:15 P.M.
Sustaining Members:
Behr-Manning, Ltd., Brantford, Canada

HARTFORD

Secretary: Stanley Platoz
26 Erwin Place, New Britain, Conn.
Meeting Place: Veterans of Foreign Wars Bldg., South St., Elmwood, Conn.
Day of Month: Third Monday
Time: 7:45 P.M.
Sustaining Members:
Arrow Hart & Hegeman Electric Company, Hartford 6 Conn
W. D. MacDermid Chemical Co., Bristol, Conn.
Royal Typewriter Company, Hartford, Conn.
The Stanley Works, New Britain, Conn.

HOUSTON

Secretary-Treasurer: Harold Bartay
4313 Oleander, Bellaire 101, Texas

Meeting Place: Ram's Club Inc., 2710 Albany St., Houston, Texas

Day of Month: Third Tuesday
Time: 6:30 P.M.

Sustaining Member:
Dixie Electro Plating Company, Houston 3, Texas

INDIANAPOLIS

Secretary: Edna Rohrabaugh
1300 Burroughs St., Lafayette, Indiana

Meeting Place: Construction League, 1456 N. Delaware St.

Day of Month: First Tuesday
Time: Dinner 6:30—Meeting 8:00 P.M.

Sustaining Members:
Arvin Industries, Inc., Columbus, Ind.
Guide Lamp Division, General Motors Corp., Anderson, Ind.
RCA Victor Div., Radio Corporation of America, Indianapolis, Ind.
Western Electric Company, Inc., Indianapolis 6, Ind.

KANSAS CITY

Secretary: Robert L. Garrett
3828 E. 9th Ter., Kansas City 27, Mo.

Meeting Place: Regan's Restaurant, 207 Southwest Blvd.

Day of Month: Second Thursday
Time: Dinner 7:00 P.M.—Meeting 8:00 P.M.

Sustaining Members:
Western Electric Co., Omaha, Nebraska

LANCASTER

Secretary-Treasurer: George Geesey
317 East Poplar St., York, Pa.

Meeting Place: Varies

Day of Month: Second Friday
Time: 8:00 P.M.

Sustaining Members:
None

LOS ANGELES

Secretary: Harvey K. Hunt
2041 S. Davie Ave., Los Angeles 22, Calif.

Meeting Place: Roger Young Auditorium, 926 W. Washington Blvd., Los Angeles, Calif.

Day of Month: Second Wednesday
Time: 7:00 P.M.

Sustaining Members:
Ajax Hardware Mfg. Co., Los Angeles 32, Calif.
Alert Supply Company, Los Angeles 22, Calif.
Associated Plating Co., Los Angeles, Calif.
The Barber-Webb Co., Inc., Los Angeles 58, Calif.
Burton Silver Plating Co., Los Angeles, Calif.
L. H. Butcher Co., Los Angeles 23, Calif.
Crown City Plating Co., El Monte, Calif.
Hall Mack Company, Los Angeles 7, Calif.
McKesson & Robbins Inc., Los Angeles, Calif.
Modern Plating Co., Los Angeles, Calif.
George E. Nichols Plating, Los Angeles, Calif.
Peterson Plating & Processing Co., Glendale 1, Calif.
Price Pfister Brass Mfg. Co., Los Angeles 31, Calif.
Rheem Automotive Co., Fullerton, Calif.
Royal Plating Works, Los Angeles 21, Calif.
Standard Nickel-Chromium Plating Co., Los Angeles, Calif.
Surface Alloys Engineering Co., Huntington Park, Calif.
Turco Products, Inc., Los Angeles 54, Calif.
Virtue Bros. Manufacturing Co., Los Angeles 45, Calif.

LOUISVILLE

Secretary-Treasurer: Charles C. Whitt
205 Saffell St., Lawrenceburg, Kentucky

Meeting Place: Hasenours Dining & Cocktail Lounge, 1028 Barrett Ave., Louisville, Kentucky

Day of Month: Third Thursday
Time: Dinner 6:30 P.M.—Meeting 8:00 P.M.

Sustaining Members:
None

MELBOURNE

Secretary: I. W. Rose
41 Glen Orme Ave., Ormand S.E. 14, Melbourne, Victoria, Australia

Meeting Place: Metallurgy Theatre, Royal Melbourne Tech. College

Day of Month: Third Thursday
Time: 7:30 P.M.

Sustaining Members:
None

MIAMI

Secretary: Frank X. Marinello
5875 E. Fifth Ave., Hialeah, Florida

Meeting Place: 5000 East 10 Court, Hialeah

Day of Month: 3rd Friday
Time: 8:00 P.M.

Sustaining Members:
None

MILWAUKEE

Secretary-Treasurer: Frederick F. Padgett
4510 N. 22nd St., Milwaukee 9, Wis.

Meeting Place: Ambassador Hotel, Milwaukee, Wisc.

Day of Month: First Friday
Time: 8:00 P.M.

Sustaining Members:
Acme Galvanizing, Inc , Milwaukee 15, Wisc
Allen Bradley Co , Milwaukee 4, Wisc
Cutler-Hammer, Inc., Milwaukee, Wisc.
Donald Sales & Mfg. Co., Milwaukee 13, Wisc.
Kohler Co., Kohler, Wisc.
Milwaukee Plating Co., Milwaukee 12, Wis.
John Oster Mfg. Co., Milwaukee 17, Wisc.
Racine Plating Co., Inc., Racine, Wisc.
Square D Company, Milwaukee 12, Wisc.
S. K. Williams Co., Milwaukee 10, Wisc.

MISSISSIPPI VALLEY

Secretary-Treasurer: Clyde N. Shepherdson
1385 Moshier Ave., Galesburg, Ill.

Meeting Place: Moline American Legion Hall, Moline, Ill.

Day of Month: Third Wednesday
Time: 8:00 P.M.

Sustaining Members:
None

MOHAWK VALLEY

Secretary-Treasurer: Henry J. Crouse
1414 Taylor Ave., Utica 3, N. Y.

Meeting Place: Thompson's Hotel, Yorkville, N. Y.

Day of Month: Second Thursday
Time: Dinner 7:00 P.M.—Meeting 8:00 P.M.

Sustaining Members:
None

MONTREAL

Secretary-Treasurer: R. W. Niggeman
c/o Empire Buff Co., Ltd., 99 College St., Montreal 30, Quebec, Canada

Meeting Place: Sheraton Mount Royal Hotel, 1455 Peel St., Montreal, P. Q.

Day of Month: Second Monday
Time: 8:30 P.M.

Sustaining Members:
Alloycraft, Ltd., Westmont, Montreal, Canada
Northern Electric Co., Ltd., Montreal, Quebec, Canada

NEWARK

Secretary: D. Gardner Foulke
455 Johnston Drive, Watchung, RFD 3, Plainfield, N. J.

Meeting Place: Robert Treat Hotel

Day of Month: Third Friday
Time: 8:15 P.M.

Sustaining Members:
American Smelting & Refining Co., South Plainfield, N. J.
Bell Telephone Laboratories, Murray Hill, N. J.
Frederick Gumm Chemical Co., Kearny, N. J.
Hanson-Van Winkle-Munning Co. (2), Matawan, N. J.
Hy Grade Electro Plating Co., Newark 7, N. J.
International Nickel Company, Inc. (2), Bayonne, N. J.
Maas & Waldstein Co., Newark 4, N. J.
Sel-Rex Corporation, Nutley 10, N. J.

NEW HAVEN

Secretary-Treasurer: Bernard J. Gaffney
40 Filbert St., Hamden, Conn.

Meeting Place: New Haven Motor Inn

Day of Month: Second Tuesday
Time: 8:00 P.M.

Sustaining Members:
Christie Plating Company, Groton, Conn.
Chromium Process Co., Shelton, Conn.
Corona Corporation, Jersey City 5, N. J.
Enthone, Inc., New Haven 2, Conn.
Lycoming Div., AVCO Mfg. Corp., Stratford, Conn.

NEW YORK

Secretary-Treasurer: Milton Nadel
162–41 Powell's Cove Blvd., Whitestone 57, N. Y.
Meeting Place: Hotel Statler
Day of Month: Second and Fourth Fridays
Time: 8:00 P.M.

Sustaining Members:

Allied Chemical Corp., Solvay Process Div., Syracuse 1, N. Y.
Allied Chemical Corp., National Aniline Div., New York 6, N. Y.
American Zinc Institute, New York, N. Y.
International Nickel Company, Inc. (3), New York, N. Y.
Lea-Ronal, Inc., Jamaica 35, N. Y.
Levco Metal Finishers, Inc., Long Island City 1, N. Y.
Magnuson Products Corp., Brooklyn, N. Y.
Metal & Thermit Corp., New York 17, N. Y.
Metals & Plastics Publications, Inc., Westwood, N. J.
Oakite Products, Inc., New York 6, N. Y.
Photocuits Corporation, Glen Cove, N. Y.
Sylvania Electric Products, Inc., Flushing, N. Y.

PHILADELPHIA

Secretary: I. William Marcovitch
1302 St. Vincent St., Philadelphia 11, Pa.
Meeting Place: Engineers' Club of Philadelphia, 1317 Spruce St., Philadelphia 7, Pa.
Day of Month: Fourth Monday
Time: 8:00 P.M.

Sustaining Members:

Accurate Electro-Plating, Inc., Philadelphia, Pa.
Aetna Electroplating Co., Inc., Philadelphia 11, Pa.
American Chemical Paint Co., Ambler, Pa.
Cleanite Products, Inc., Cornwells Heights, Pa.
General Plating Co., Trenton, N. J.
Leeds & Northrup, Philadelphia 44, Pa.
Pennsalt Chemicals Corporation, Philadelphia, Pa.
Philadelphia Rust Proof Co., Philadelphia 34, Pa.
Progress Mfg. Co., Inc., Philadelphia 34, Pa.
Radio Corporation of America, Camden 2, N. J.
The Reynolds Co., Philadelphia 32, Pa.

PHOENIX

Secretary: James Weaver
6802 Paradise Parkway, Scottsdale, Arizona
Meeting Place: Armed Services Officers Club
3334 East Camelback, Phoenix.

PITTSBURGH

Secretary: Edward B. Keller
1102 Sunday St., Pittsburgh 12, Pa.
Meeting Place: Gateway Plaza, Pittsburgh, Pa.
Day of Month: Second Wednesday
Time: Dinner 6:30 P.M.—Meeting 8:00 P.M.

Sustaining Members:

Aluminum Company of America, New Kensington, Pa.
Rockwell-Standard Corp., Standard Steel Spring Div., Coraopolis, Pa.
Weirton Steel Co., Weirton, West Va.
Westinghouse Electric Corp., East Pittsburgh, Pa.

PORTLAND

Secretary-Treasurer: Edward Elkins
United Chemical Co., Ltd., Portland, Ore.
Meeting Place: Various
Day of Month: Open
Time: 6:30 P.M.

Sustaining Members:
None

PROVIDENCE-ATTLEBORO

Secretary: Dr. Edward A. Parker
Technic Inc., P. O. Box 965, Providence, R. I.
Meeting Place: Providence Engineering Society Building, 195 Angell St., Providence, R. I.
Day of Month: Third Monday
Time: 8:00 P.M.

Sustaining Members:

Gorham Manufacturing Co., Providence 7, R. I.
Walton & Lonsbury, Attleboro, Mass.

ROCHESTER

Secretary-Treasurer: Barrie M. Gardner
129 Ridgewood Rd., Rochester 15, N. Y.
Meeting Place: Rochester German Club, Rochester, N. Y.
Day of Month: First Monday
Time: 8:00 P.M.

Sustaining Members:

Eastman-Kodak Co. (2), Rochester 4, N. Y.
Stromberg-Carlson Co., Rochester, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Wollensak Optical Co., Rochester, N. Y.

ROCKFORD

Secretary-Treasurer: E. J. Budden
122 12th St., Rockford, Ill.
Meeting Place: Faust Hotel, Rockford, Ill.
Day of Month: Second Monday
Time: 7:00 P.M.

Sustaining Members:

National Lock Co., Rockford, Ill.

SAGINAW VALLEY

Secretary-Treasurer: George Savage
2921 Concord, Flint 4, Mich.
Meeting Place: Zehnder, Frankenmuth, Michigan
Day of Month: Second Wednesday
Time: 6:45 P.M.

Sustaining Members:

American Buff Co., Chicago 16, Illinois

ST. JOSEPH VALLEY

Secretary: Henry A. Meers
2001 Bergan St., South Bend, Ind.
Meeting Place: Lincoln Highway Inn, Mishawaka, Ind.
Day of Month: First Wednesday
Time: 7:00 P.M.

Sustaining Members:

Bendix Aviation Corp., Bendix Prods. Div. South Bend 20, Ind.
Inland Chemical Corporation, Fort Wayne, Ind.
Leco Plating Co., St. Joseph, Mich.
Rockwell-Standard Corp., Mishawaka, Ind.
Roth Plating Corporation, South Bend, Ind.
South Side Plating Works, Inc., Elkhart, Ind.
Standard Plating Works, Inc., Goshen, Ind.
The Studebaker-Packard Corp., South Bend, Ind.

ST. LOUIS

Secretary: Ward W. Kelly
7046 Deerpath Drive, St. Louis 23, Mo.
Meeting Place: York Hotel, Sixth St. & Market St. St. Louis, Missouri
Day of Month: Second Wednesday
Time: Dinner 6:45 P.M.—Meeting 8:00 P.M.

Sustaining Members:

American Zinc Sales Co., St. Louis, Mo.
Bussman Mfg. Co., St. Louis, Mo.
Chandeysson Electric Co., St. Louis, Mo.
Davies Supply & Mfg. Co., St. Louis 16, Mo.
Folding Carrier Corp., Oklahoma City, Okla.
C. Hager & Sons Hinge Mfg. Co., St. Louis 5, Mo.
Knapp-Monarch Co., St. Louis 16, Mo.
Lasalco, Inc., St. Louis 4, Mo.
National Rejectors, Inc., St. Louis 15, Mo.
G. S. Robins Co., St. Louis 2, Mo.
Sommers Brothers Mfg. Co., St. Louis 7, Mo.

SAN FRANCISCO

Secretary-Treasurer: C. E. Snelgrove
c/o L. H. Butcher Co., 15th & Vermont Sts., San Francisco, Calif.
Meeting Place: International Inn, South San Francisco, Calif.
Day of Month: Second Thursday
Time: 7:00 P.M.

Sustaining Members:

Schlage Lock Co., San Francisco 19, Calif.
Wildberg Bros. Smelting & Refining Co., San Francisco 2, Calif.

SEATTLE-PUGET SOUND

Secretary: Mrs. Helen Archibald
17814 Palatine, Seattle, Wash.

Meeting Place: Andy's Diner, Seattle, Wash.

Day of Month: Third Tuesday (Flexible)
Time: 7:00 P.M.—Meeting 8:00 P.M.

Sustaining Members:
Kaiser Aluminum & Chemical Corp. Spokane, Wash.

SOUTHEASTERN

Secretary-Treasurer: H. R. Stogner Sr.
2631 Tilson Road, Decatur, Georgia

Meeting Place: Belmont Steak House, Downtown Luckie St., Atlanta, Ga.

Day of Month: Second Friday
Time: 7:30 P.M.

Sustaining Member:
Production Plating Company, Adel, Ga.

SOUTHERN TIER

Secretary: Bill Rossiter
5 Ellen St., Rt. 97, Binghamton, N. Y.

Meeting Place: Carlton Hotel, Binghamton, N. Y., and Pierce's Restaurant, Elmira, N.Y.

Day of Month: Third Tuesday
Time: 7:15 P.M.

Sustaining Members:
International Business Machines Corp., Endicott, N. Y.

SPRINGFIELD

Secretary: Henry L. Heissfeld
74 Chilson St., Springfield, Mass.

Meeting Place: Blake's Restaurant, 15 Market St., Springfield, Mass

Day of Month: Fourth Monday
Time: Dinner 7:00 P.M.—Technical Session 8:00 P.M.

Sustaining Members:
The Chemical Corporation, Springfield, Mass.
Moore Drop Forging Co., Springfield, Mass.

SYDNEY

Secretary-Treasurer: M. R. MacKinnon
3 Hyde Brae St., Strathfield New South Wales- Australia

Meeting Place: Theatrette, Sydney Technical College, Harris St., Ultimo, Sydney

Day of Month: Second Wednesday
Time: 7:30 P.M.

Sustaining Members:
None

SYRACUSE

Secretary: Robert A. Carpenter
138 Oakland St., Syracuse, N. Y.

Meeting Place: Turn Hall, 619 N. Salina St., Syracuse, N. Y.

Day of Month: Third Monday
Time: Dinner 6:45 P.M.—Meeting 8:00 P.M.

Sustaining Members:
Oneida, Ltd., Oneida, N. Y.

Special Contributions to Research Fund, (1959-1960): American Society for Testing Materials. Foreign Sustaining Members: Ingalco S. R. L. Co., Buenos Aires, Argentina.

TOLEDO

Secretary-Treasurer: Ben Gomersall
6015 Anthony Wayne Trail, Route 1, Maumee, Ohio

Meeting Place: Angelo's Spaghetti House, Stickney Ave., Toledo, Ohio

Day of Month: First Thursday
Time: Dinner 7:00 P.M.—Meeting 8:00 P.M.

Sustaining Member:
The Electric Auto-Lite Co. (2), Sharonville 8, Ohio

TORONTO

Secretary: R. H. Clark
262 Woburn Avenue, Toronto, 12, Ontario, Canada

Meeting Place: Royal York Hotel, Toronto, Ontario, Canada

Day of Month: Second Friday
Time: Dinner 6:30 P.M.—Meeting 8:15 P.M.

Sustaining Members:
Armalite Company, Ltd., Toronto, Ontario, Canada
British Chrome & Chemicals (Canada) Ltd., Toronto 5, Ontario, Canada
Canadian Hanson & Van Winkle Co., Ltd., Toronto, Ontario, Canada
Canadian Motor Lamp Company Ltd., Windsor, Ontario, Canada
Houdaille Industries of Canada, Ltd., Oshawa, Ontario, Canada
International Business Machines Co., Toronto 6, Ontario, Canada
International Nickel Co. of Canada, Ltd., (3) Toronto, Ontario, Canada
Lea Manufacturing Co. of Canada, Ltd., Scarborough, Ontario, Canada
Metal & Thermit—United Chromium of Canada, Ltd., Rexdale, Ontario, Canada
Sunbeam Corp. (Canada) Ltd., Toronto 18, Ontario, Canada
The de Havilland Aircraft of Canada, Ltd., Downsview, Ontario, Canada
W. W. Wells, Ltd., Scarborough, Ontario, Canada

WATERBURY

Secretary-Treasurer: James R. Kennedy
Risdon Mfg. Co., P. O. Box 32, Waterbury 20, Conn.

Meeting Place: Colonial Room, Roger Smith-Elton Hotel

Day of Month: Second Thursday
Time: Dinner 6:30 P.M.—Meeting 8:30 P.M.

Sustaining Members:
American Brass Company, Waterbury 20, Conn.
American Chemical & Refining Co., Waterbury, Conn.
Apothecaries-Hall Co., Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chromium Corporation of America, New York, N. Y.
Harper Leader, Inc., Waterbury 20, Conn
The International Silver Co., Meriden, Conn.
The Lea Mfg Co., Waterbury 20, Conn.
Lux Clock Manufacturing Co., Waterbury, Conn
MacDermid, Inc., Waterbury 20, Conn.
The Patent Button Co., Waterbury 2, Conn.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
The Summit Finishing Co., Inc., Thomaston, Conn.
Wallace Silversmiths, Inc., Waterbury, Conn.
The Waterbury Plating Co., Waterbury 86, Conn.
Whyco Chromium Co., Inc., Thomaston, Conn.

WESTERN ONTARIO

Secretary-Treasurer: Robert Dobson
Box 41, Watford, Ontario, Canada

Meeting Place: William Pitt Hotel, Chatham, Ontario, Canada

Day of Month: Third Friday
Time: 6:30 P.M.—Dinner-Meeting

Sustaining Members:
Bendix Eclipse of Canada, Ltd., Windsor, Ontario, Canada
General Motors of Canada, Ltd., Oshawa, Ontario, Canada
Ontario Steel Products Co., Ltd., Chatham, Ontario, Canada

WICHITA

Secretary: Richard Bartholomew
2029 Ohio, Augusta, Kansas

Meeting Place: Oriental Restaurant, 5405 E. Central, Wichita, Kas.

Day of Month: Fourth Wednesday
Time: 6:30 P.M.

Sustaining Members:
None

LOS ANGELES BRANCH: AES's WEST COAST PIONEER

BACK in 1929 when a fabulous America was riding the crest in finance of a "bull market" whose unbelievable scale and flair surpassed the dreams of even the most imaginative of that era's fiscal visionaries, surging American Electroplaters' Society, Inc. (AES), cast its eyes upon further expansion—upon broader vistas wherein to stimulate advancements in electroplating, metal finishing and allied arts.

With Branches already existing as far west as St. Louis, AES took a good hard look at the "Wonder City" lustily growing in mushrooming California, and decided that the time had arrived to span the American Continent by chartering a Branch in Los Angeles.

Los Angeles had just about completed clearing away the debris from that community's 1929 New Year's celebrations when a small group of farsighted platers, determined upon creating an AES Branch in that city, came together in exploratory meeting for that purpose.

At that dinner meeting held on Monday, January 7, 1929, at the Elite Catering at 633 South Flower Street in Los Angeles, not only was it consensus that such a Branch be formed but also that an organization be created without delay. As officers pro tempore, therefore, that pioneering group named Robert Gripp, President; Donald M. Bedwell, Vice President; M. D. Rynkofs, Secretary-Treasurer; C. A. Russell, Librarian and J. Jacques, Sergeant-at-Arms. E. W. Francis, H. H. Dummit and Frank C. Rushton were appointed to the temporary Board of Managers.

The proposed AES Los Angeles Branch was consequently enroute to existence from this modest start.

AES EXPANSION REACHES LOS ANGELES

The benefits of AES affiliation were not new to most of these West Coast plating trailblazers inasmuch as most of them had been Branch officers or key members of Eastern AES Branches prior to coming to Los Angeles.

And when the group's next meeting was held at the Los Angeles Y. M. C. A. a month later, the nucleus body had already multiplied to include such names that have since threaded the Los Angeles Branch's history as: A. J. Brannon, Benjamin Foss, Lewis Blaisdell, E. P. Robinson, Phillip M. Virtue, Earl Coffin, Ray Vasquez, O. S. Pendlay, George W. Kyle, Martin H. Brooks, B. D. Gardes, Charles H. Howe, E. D. Bedwell, J. R. Delaney, M. McNulty, J. A. Kirose, E. D. Martin, E. A. Savory and Harold Coombes.

Under Clarence Thornton who succeeded Robert Gripp

as the founding body's bellwether when the latter moved eastward shortly after the group's first assembly, the prospective Branch applied to the AES for Temporary Charter. After due probationary period, it consequently was permanently chartered as an AES Branch in September 1929 with 31 charter members.

As AES itself completed its second decade of life in 1929, therefore, the Society was composed of 25 thriving Branches in the United States and Canada, including Los Angeles, its very first Branch west of the Rockies.

EDUCATION AS BASIS OF LOS ANGELES BRANCH RISE

Though the Los Angeles Branch—like most AES Branches—in fact, like most businesses and most individuals of that period—had a temporary setback in 1932-1934 when the nation was engulfed in its most acute business depression in American history, that Branch has otherwise gone forward uninterruptedly from birth.

By 1949, twenty years after its creation, it had already won two AES trophies for the largest annual membership increase in the Society's Branch membership standings. AES's San Francisco Branch and its Adelaide, Melbourne and Sydney, Australia, Branches were fathered by Los Angeles Branch members transferred to those communities. The Branch's educational activities had contributed much to the advancements of plating and metal finishing in Los Angeles, industrially swelling titan of America's west coast.

From the Los Angeles Branch's beginnings, in fact, technical and scientific education, basic mission of the AES everywhere, had been the wellspring from which its stability and progress mainly stemmed.

In its earlier days, for instance, it sponsored classes in the fundamentals of chemistry in two of the city's leading high schools. Thereafter, it sponsored a curriculum given as an extension class at the University of California.

Education, moreover, was and is a main focus of the Branch's own monthly meetings. These have been planned with emphasis upon technical subjects of wide membership interest. Speakers have been selected, experts on such subjects, able to attract and to communicate to many men and women seriously interested in being educationally enriched.

Yearly, in Spring, through the years, furthermore, an all-day Educational Program has been conducted concentrated upon advancing knowledge in electroplating, metal finishing and allied arts. The seriousness and thought given to this annual event (always capped by a banquet plus fellowship and fun) have been crowned by large Branch attendance, with many members traveling large California distances to be present.

AES HONORS EARNED BY THAT DYNAMIC BRANCH

The dedication and effort of Los Angeles Branch leaders, through the years, have neither gone unnoticed nor unrewarded by AES. Three such men, namely Ernest Lamoureux, Frank C. Rushton and Donald M. Bedwell, were upgraded by the Supreme Society to AES Honorary Membership, a summit AES honor exclusively reserved for those AES members of widely recognized eminence in the field of work of the Society who have rendered conspicuously meritorious service to it.

On two occasions, the Supreme Society demonstrated AES's respect for the quality and significance of Los Angeles, its first West Coast Branch, by naming it Host Branch of an AES National Convention. On both of these occasions, the National Convention had to be shifted elsewhere. In the first instance, World War II and the limitations imposed upon distance travel by war conditions, compelled change to another Convention site. In the second case, the Korean struggle motivated the transfer.

At the Supreme Society's Annual Meeting held in Washington in June 1956, the Los Angeles Branch deservedly received its third opportunity to stage an Annual Convention for the AES as Host Branch. To occur in that "Wonder City," July 24-28, 1960, the 47th Annual Convention promises to rate among the outstanding AES national assemblies in the Society's half-century history.

LOS ANGELES BRANCH ON THRESHOLD OF ITS GOLDEN ERA

Modern Los Angeles is a city bulging with muscle—vibrating with confidence and enthusiasm—always looking ahead to things that must be accomplished in the future. There has been no more phenomenal and sustained industrial, commercial and population growth in any area of the United States than that which has occurred in the City and County of Los Angeles in the three decades since the founding of the AES's dynamic Los Angeles Branch.

Plating and metal finishing are in a period of growth in Los Angeles whose tempo is commensurate with the sprinting pace of the City's industrial expansion.

Against this promising background, the Los Angeles Branch is at the threshhold of its own Golden Era. Today with over 300 members, it already ranks fifth in membership stature among AES chartered Branches here, in Canada and Australia. Its rate of growth, however, is even closer to the top of the AES Branch heap.

Industrial companies that are Sustaining Members of the AES under the aegis of the Los Angeles Branch include the following:

Ajax Hardware Manufacturing Corp., Los Angeles
Alert Supply Company, Los Angeles
Associated Plating Company, Los Angeles
The Barber-Webb Company, Inc. Los Angeles
Burton Silverplating Company Los Angeles
L. H. Butcher Company, Los Angeles
Crown City Plating Company, El Monte
Hall Mack Company, Los Angeles
McKesson & Robbins, Inc., Los Angeles
Modern Plating Company, Los Angeles
George E. Nichols Plating, West Los Angeles
Peterson Plating & Processing Co., Glendale
Price Pfister Brass Mfg., Co., Los Angeles
Rheem Automotive Company, Fullerton
Royal Plating Works, Los Angeles
Standard Nickel-Chromium Plating Co., Los Angeles
Surface Alloys Engineering Co., Huntington Park
Turco Products, Inc., Los Angeles
Virtue Bros. Manufacturing Co., Los Angeles

The unprecedented growth in Los Angeles of such pioneering industries as electronics, instrumentation, research and development and other engineering activities, has brought the title, "Creative Center of America" to that city. And Los Angeles has earned that title by successful search for new ways to make better products.

Advancements in electroplating and metal finishing, in turn, have played a part in fabricating many of those improved products that have helped earn that title for Los Angeles.

And as Los Angeles develops, it is the AES's confident trust that its own Los Angeles Branch membership will have contributed its share to that continued industrial progress through studied improvements in plating and metal finishing aided by AES research and educational enrichment.

NORRIS POULSON
MAYOR

OFFICE OF THE MAYOR
CITY HALL
LOS ANGELES 12, CALIFORNIA

PROCLAMATION

TO THE CITIZENS OF LOS ANGELES, GREETINGS:

WHEREAS, Los Angeles will be the site this year of the Annual Convention of the American Electroplaters' Society, Inc., and

WHEREAS, the Los Angeles branch of this organization is more than 30 years old, indicating that this city is a leader not only in the electroplating industry but also in its scientific organizations and advancement, and

WHEREAS, electroplating is an industry which treats materials used by everyone in his home and business;

NOW, THEREFORE, as Mayor of the City of Los Angeles, I proclaim the week of July 24-28, 1960, as AMERICAN ELECTROPLATERS' SOCIETY WEEK and I call upon all citizens to familiarize themselves with this important organization and its contributions to better living.

Norris Poulson
MAYOR

EDMUND G. BROWN
GOVERNOR

State of California

GOVERNOR'S OFFICE
SACRAMENTO

GREETINGS TO THE MEMBERS OF THE
AMERICAN ELECTROPLATERS' SOCIETY, INC.

It is a pleasure to extend a warm California welcome to the Forty-seventh Annual Convention of the American Electroplaters' Society.

The Golden State is honored to be host to this important nationwide organization, and its citizens are fortunate to have the opportunity of learning more about the vast scope of its productivity, touching the lives of all of us.

The AES research program, widely recognized for its support of outstanding projects at universities in both the United States and Canada, doubtless will have valuable reports to make of high interest to industry in California and the nation.

To all delegates, their families and friends may I express best wishes for a most successful convention and a pleasant sojourn in Los Angeles.

Sincerely

Edmund G. Brown

EDMUND G. BROWN
Governor of California

CONVENTION PROGRAM

SUNDAY, JULY 24

9:00 a. m. **Executive Board Meeting (All Day)** — **Dallas Room (Hq. Room)**
10:30 a. m. **Ladies' Program. Brunch Honoring National Officers Wives—Sponsored by Los Angeles Branch** — **Boston Room**
2:00 p. m. **Honorary Membership Award Committee Meeting** — **Washington Room**
2:00 p. m. **Scientific Achievement Award Committee Meeting** — **St. Louis Room**
3:00 p. m. **Ladies Program. Western Welcome Tea** — **Garden Room**
4:00 p. m. **Credentials Committee Meeting with Executive Board** — **Dallas Room**
8:00 p. m. **Get-Together Party** — **Golden State Room**

MONDAY, JULY 25

8:30 a. m. **Children's Program—Supervised Bus Outing** — **Leave from Statler Hotel**
Itinerary includes Forest Lawn Park, Griffith Park, Universal-International Movie Studio, Farmers' Market (includes lunch), "Homes of the Stars" in Hollywood and Beverly Hills, Santa Monica Beach
10:00 a. m. **Grand Opening Session** — **Golden State Room**
11:00 a. m. **Business Meeting, Supreme Society** — **Golden State Room**
12:00 noon **Branch Secretaries' Luncheon** — **New York Room**
12:00 noon **Ladies Program. Luncheon and Entertainment** — **Pacific Room**
12:15 p. m. **Speakers' Luncheon** — **Cleveland Room**
2:00 p. m. **Educational Opening Session** — **Golden State Room**
The Second Annual "William Blum Lecture"—"Faraday's Laws Applied to Cleaning" by Dr. A. Kenneth Graham, Graham, Savage & Associates, Inc., Second Winner, AES Scientific Achievement Award
2:00 p. m. **Plant Visit, U.S. Chem Milling Corp., Manhattan Beach** — **Bus from Statler Hotel**
2:30 p. m. **Editorial Board Meeting** — **Boston Room**
2:30 p. m. **Midwest Regional Council Meeting** — **Dallas Room**
2:30 p. m. **Educational Session A** — **Golden State Room**
"Applying Statistical Quality Control to Plating Processes" by Robert W. Steinmetz, Western Electric Company, Inc.
"Chemical Milling: Controlled Metal Removal With Chemicals" by C. Conner Shepherd, North American Aviation, Inc.
"Hazards in the Plating Room" by Dr. Walter R. Meyer, Enthone, Inc., Subsidiary of American Smelting and Refining Company
2:30 p. m. **Educational Session B** — **West Garden Room**
"Adhesion of Organic Enamels to Electrodeposited Nickel" by Francis X. Carlin, The International Nickel Company, Inc., Research Laboratory
"Solid Film Lubricants as Organic Finishes" by Lowell C. Horwedel, Electrofilm, Inc.
"Magnesium Corrosion" by E. I. Weed, Convair/Pomona, Convair Division of General Dynamics Corporation
4:00 p. m. **Order of Past Presidents' Business Meeting** — **Detroit Room**
6:30 p. m. **Order of Past Presidents' Dinner** — **Washington Room**
8:00 p. m. **Convention Ball (Sponsored by Metal Finishing Suppliers' Association—Admittance by Registration Badge)** — **Pacific & Sierra Rooms**

TUESDAY, JULY 26

8:00 a. m. **Charles Henry Proctor Memorial Leadership Award Selection Committee Breakfast** — **Boston Room**
8:00 a. m. **Speakers' Breakfast** — **Cleveland Room**
8:30 a. m. **Golf Tournament (Sponsored by MFSA)** — **Los Coyotes Country Club, Buena Park**
9:00 a. m. **Membership Committee Meeting** — **Washington Room**
9:00 a. m. **Public Relations Committee Meeting** — **Detroit Room**
9:00 a. m. **Southwestern Regional Council—Organization Meeting** — **Dallas Room**
9:00 a. m. **Educational Session C** — **Golden State Room**
"Recent Developments in Gold Electroplating" by Barnet D. Ostrow, Lea-Ronal, Inc.
"A Cyanide Bath for Heavy Gold Plating" by James K. Gore and Robert Seegmiller, University of California, Los Alamos Scientific Laboratory
"Acid Gold Plating" by Robert A. Ehrhardt, Bell Telephone Laboratories, Inc.
9:00 a. m. **Educational Session D** — **West Garden Room**
"Corrosion and Electrode Potential Studies of Nickel-Chromium Systems" by Arthur H. Du Rose, The Harshaw Chemical Company
"A Progress Report on Experiences in Improving the Corrosion Resistance of Automotive Parts" by J. D. Thomas, D. W. Hardesty and C. F. Nixon, General Motors Corporation Research Laboratories

"New Data on the Performance of Nickel and Chromium Plated Zinc Die Castings" by W. H. Safranek, H. R. Miller, R. W. Hardy, and Dr. C. L. Faust, Battelle Memorial Institute

"A Study of Variations in Certain Characteristics of Bright Nickel Deposits with Variations in Bath Temperature" by R. J. Clauss, The Udylite Research Corporation

2:30 p. m. Annual Outing (Buses leave Statler Hotel) ..... **Disneyland**

WEDNESDAY, JULY 27

8:00 a. m. Research Committee Breakfast ..... **Cleveland Room**
8:00 a. m. Speakers' Breakfast ..... **Buffalo Room**
8:30 a. m. Children's Program—Supervised Visit ..... **Bus from Statler Hotel**
Marine Land of the Pacific and Knott's Berry Farm (lunch)
9:00 a. m. Educational Session E—"Hydrogen Embrittlement in Metal Finishing" Symposium ..... **Golden State Room**

"The Metallurgical Aspects of Hydrogen Embrittlement in Metal Finishing" by Dr. Harold J. Read, Department of Metallurgy, The Pennsylvania State University

"On the Mechanism of Transport of Hydrogen Across a Solution-Metal Interface" by Dr. Richard J. Barton, Wright Air Development Division, Wright-Patterson Air Force Base

"The Behavior of Hydrogen in Iron and Steel" by Maynard L. Hill, Westinghouse Electric Corporation Research Laboratories

"Detection and Control of Chemisorbed Hydrogen During Electrolysis" by Samuel C. Lawrence Jr., Metal Physics Laboratory, Boeing Airplane Company

9:00 a. m. Research Committee Meeting ..... **Detroit Room**
9:00 a. m. Publications Committee Meeting ..... **Boston Room**
9:00 a. m. Educational Committee Meeting ..... **Washington Room**
12:00 noon Joint Educational Committee and Branch Librarians' Luncheon ..... **New York Room**
12:00 noon Speakers' Luncheon ..... **Buffalo Room**
12:30 p. m. Ladies' Program. Luncheon and Don Loper Fashion Show (Buses leave Statler Hotel at 11:00 a. m.) ..... **Sportsmen's Lodge, North Hollywood**
2:00 p. m. Research Committee Meeting ..... **Detroit Room**
2:00 p. m. Educational Session F—"Hydrogen Embrittlement in Metal Finishing" Symposium ..... **Golden State Room**

"Measurements Pertaining to Hydrogen Embrittlement" by Cloyd A. Snavely, Battelle Memorial Institute

"A New Look at the Hydrogen Embrittlement of Cadmium Coated High Strength Steels" by Norman M. Geyer, G. William Lawless, and Bennie Cohen, Materials Laboratory, Wright Air Development Center, Wright-Patterson Air Force Base

"Effectiveness of Metallic Undercoats in Minimizing Plating Embrittlement of Ultra High Strength Steel" by Dr. Walter Beck and E. J. Jankowsky, Naval Air Material Center, Aeronautical Materials Laboratory

"Control of Hydrogen Embrittlement by Plating from Cadmium Cyanide Baths Containing Nitrate" by Dr. W. F. Hamilton and Myron Levine, Lockheed Aircraft Corporation, California Division

4:00 p. m. AES Regional Group and Council Chairmen's Meeting ..... **Dallas Room**
7:30 p. m. Round Table Discussion on "Hydrogen Embrittlement in Metal Finishing" ..... **Los Angeles Room**
9:30 p. m. Floor Show and Dance ..... **Pacific & Sierra Rooms**

THURSDAY, JULY 28

8:00 a. m. Speakers' Breakfast ..... **St. Louis Room**
8:30 a. m. Children's Program ..... **(Bus time to be Announced)**
9:00 a. m. Business Meeting, Supreme Society ..... **Sierra Room**
9:00 a. m. Educational Session G ..... **Golden State Room**

"Magnetic Properties of Electrodeposited Cobalt Alloys" by Dr. Victor Zentner, Hughes Aircraft Company

"Plating of Nickel, Cobalt, Iron and Cadmium from Sulfamate Solutions" by Richard C. Barrett, Barrett Chemical Products Company

"The Chemical Reduction of Nickel-Phosphorus Alloys from Pyrophosphate Solutions" by Morton Schwartz, Kelite Corporation

9:00 a. m. Educational Session H ..... **West Garden Room**

"Solution Transfer in Barrel Plating" by Paul Glab, R. Scott Modjeska and Simon P. Gary, Scientific Control Laboratories, Inc.

"Cleaning Techniques in the Electronics Industry" by Dr. D. E. Koontz, Dr. D. O. Feder and Dr. C. O. Thomas, Bell Telephone Laboratories, Inc.

"Chromium Plating of Rifle Barrels" by Robert J. Girard and Edward F. Koetsch Jr., Springfield Armory

9:30 a. m. Plant Visit, McCulloch Corp., Los Angeles ..... **Bus from Statler Hotel**
10:30 a. m. Ladies' Program. Motion Picture Studio Tour ..... **Bus from Statler Hotel**
12:30 p. m. Ladies' Luncheon (Dutch Treat) and Shopping ..... **Farmer's Marke**
1:00 p. m. Plant Visit, Golden Citrus Juices, Inc., Anaheim ..... **Bus from Statler Hotel**
2:00 p. m. Business Meeting, Supreme Society ..... **Sierra Room**
2:00 p. m. Educational Session I ..... **Golden State Room**

"AES Research—Its Purpose and Accomplishments" by J. D. Thomas, 1959–1960 Chairman, AES Research Committee

"Corrosion Protection with Decorative Chromium" by Dr. E. J. Seyb, Metal & Thermit Corporation

"Experience in the Operation and Performance of Dual Chromium Systems" by W. E. Lovell, E. H. Shotwell and James Boyd, Ternstedt Division, General Motors Corporation

6:00 p. m. Cocktail Party (Sponsored by Metal Finishing Suppliers' Association) ..... **Wilshire Room**
7:00 p. m. Annual Banquet and Dance ..... **Pacific & Sierra Rooms**

FRIDAY, JULY 29

8:00 a. m. President's Breakfast to National Officers & Families ..... **AES Executive Suite**
9:00 a. m. Executive Board Meeting ..... **Dallas Room**

BEFORE THE SUPREME SOCIETY

AGENDA
FIRST BUSINESS SESSION

GOLDEN STATE ROOM
STATLER HOTEL, LOS ANGELES, CALIFORNIA
MONDAY MORNING, JULY 25, 1960

I Call to Order, ANNUAL MEETING.
II Roll Call of Officers.
III Report of Credentials Committee.
IV Roll Call of Delegates.
V In Memoriam.
VI Reports of Officers (Published Copies in DELEGATES KITS):
- (a) President
- (b) First Vice President
- (c) Second Vice President
- (d) Third Vice President
- (e) Past President
- (f) Executive Secretary

VII Reports of Standing and Special Committees (Copies in DELEGATES KITS).
VIII Report on New Branches.
IX 1959–1960 Financial Statement and 1960–1961 Budget (Copies in DELEGATES KITS).
X Report of Paper Awards Committee and Presentation of Awards.
XI Announcement of Board Appointments To:
- (a) Editorial Board
- (b) Research Committee
- (c) Public Relations Committee
- (d) Election Committee
- (e) Honorary Membership Awards Committee
- (f) Educational Committee
- (g) Membership Committee
- (h) Publications Committee
- (i) Scientific Achievement Award Committee

XII Business Brought for Discussion by Delegates.
XIII Recess of ANNUAL MEETING.

AGENDA
SECOND BUSINESS SESSION

SIERRA ROOM, STATLER HOTEL, LOS ANGELES
THURSDAY, JULY 28, 1960

I Call to Order, ANNUAL MEETING.
II Roll Call of Officers.
III Roll Call of Delegates.
IV Roll Call of Living Past Presidents.
V Financial Statement (1959–1960) and Proposed Operating Budget (1960–1961):
- (a) Action on Financial Statement
- (b) Action on Proposed Operating Budget (1960–1961)
- (c) Report of Executive Board on reinvestment of Reserves

VI Consideration of Any "Sense of Meeting" Resolutions Adopted by the Seventh Interim Meeting.
VII Report on Membership Competition. Presentation of Awards.
VIII Action on Nominees for AES Honorary Membership.
IX Introduction of 1960 "AES Scientific Achievement Award" Winner.
X Business Brought for Discussion by Delegates.
XI Discharge of 1959–1960 Special Committees.
XII Nomination and Election of 1960–1961 Officers:
- (a) President
- (b) First Vice President
- (c) Second Vice President
- (d) Third Vice President

XIII Installation Ceremony:
- (a) Installation of Newly Elected Officers
- (b) Presentation of Gavel to New President
- (c) Presentation of Plaque and Past President's Pin to Retiring President

XIV Report by Los Angeles Convention General Chairman.
XV Reports by Future Convention Chairmen (Boston, Milwaukee, Atlantic City, St. Louis, New York).
XVI Report of Eighth Interim Meeting (1961) Chairman.
XVII Selection of Convention City of AES's Fifty-Third Annual Convention (1966).
XVIII Recommendation of Executive Board as to Place and Date of AES's Sixth Industrial Finishing Exposition.
XIX Selection of Site and Date of Ninth Interim Meeting (1962).
XX Resolution of Thanks to Los Angeles Branch.
XXI Adjournment of ANNUAL MEETING.

EDUCATIONAL SESSIONS CHAIRMEN
AES 47th ANNUAL CONVENTION
LOS ANGELES, CALIFORNIA

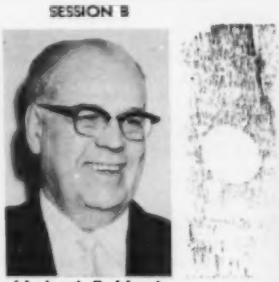
OPENING SESSION

Dr. William Blum

SESSION A

Dr. Harold J. Wiesner

SESSION B



Herberth E. Head

SESSION C

Dr. Russel E. Harr

SESSION D

Dr. R. B. Saltonstall

SESSION E

Dr. Herold J. Read

SESSION F

Dr. Samuel Heiman

SESSION G

Dr. Abraham M. Max

SESSION H

Francis T. Eddy

SESSION I

Maurice R. Caldwell

EDUCATIONAL SESSIONS PROGRAM

47TH ANNUAL CONVENTION, AMERICAN ELECTROPLATERS' SOCIETY, INC.

STATLER HOTEL, LOS ANGELES, CALIFORNIA, JULY 24-28, 1960

MONDAY, JULY 25

OPENING SESSION

2:00 p.m. ..... Golden State Room

Session Chairman—*Dr. William Blum*

THE SECOND ANNUAL "WILLIAM BLUM LECTURE"— FARADAY'S LAWS APPLIED TO CLEANING

by Dr. A. Kenneth Graham, Graham, Savage & Associates, Inc.

2:30 p.m. ..... Golden State Room

SESSION A

Chairman—*Dr. Harold J. Wiesner, Bendix Products Division, Bendix Aviation Corporation*

APPLYING STATISTICAL QUALITY CONTROL TO PLATING PROCESSES

by Robert W. Steinmetz, Western Electric Company, Inc.

Statistical quality control is a scientific method of analyzing data and using the analysis to solve practical problems. Its application to the control of plating baths and plating thickness to reduce costs and increase quality is illustrated. Cost reduction and quality improvement can be illustrated best by utilizing the control chart which has the ability to form data into patterns which when tested statistically can lead to information about the process.

CHEMICAL MILLING: CONTROLLED METAL REMOVAL WITH CHEMICALS

by C. Conner Shepherd, North American Aviation, Inc.

The factors which have led to the development of chemical techniques for metal removal are discussed in relation to present applications of the chemical milling process. The factors to be considered in selection of a chemical etchant are described, along with variables influencing efficiency of the major processing steps.

HAZARDS IN THE PLATING ROOM

by Dr. Walter R. Meyer, Enthone, Inc., Subsidiary of American Smelting and Refining Company

Hazards in the plating room including fire, explosion, eruption, uncontrolled reactions and electrical are discussed. Uncontrolled chemical reactions are discussed at length including reactions of oxidizing agents such as hydrogen peroxide, chromic acid, permanganate, perchlorates, persulphates, etc. Accidents involving identity of chemicals, rate of mixing, spontaneous combustion autoignition, metal dust explosions, heats of reaction, caking, electrical shorts and poor housekeeping are described. Hazards of bright dipping and electropolishing solutions are described at length as well as many types of hydrogen explosions. Actual vivid demonstrations of explosions and hazards are presented.

2:30 p.m. ..... West Garden Room

SESSION B

Chairman—*Herberth E. Head, Engineering Division, Chrysler Corporation*

ADHESION OF ORGANIC ENAMELS TO ELECTRODEPOSITED NICKEL

by Francis X. Carlin, The International Nickel Company, Inc., Research Laboratory

Strong bonds between freshly deposited nickel and subsequent organic enamel finishes have been affected. Various aqueous solutions of organic and inorganic compounds are employed as post-treatments for the electrodeposits. The solutions apparently react either to cause a conversion-type film on the nickel surface or to deposit a thin film of material which becomes strongly bonded to nickel. The film produced is receptive to application of a coating of organic enamel. Types of solutions, methods of application of nickel, films, and organic finishes, and the method for testing the bond are discussed.

SOLID FILM LUBRICANTS AS ORGANIC FINISHES

by Lowell C. Horwedel, Electrofilm, Inc.

The place in which solid film lubricants fit into the organic finishing industry is presented. The diversified field of their application as organic finishes, due to such physical properties as color, electrical conductivity, corrosion resistance and others is discussed. Emphasis is placed on corrosion resistance and substantiating data is presented graphically and with photographs. The effect of pre-treatments on the corrosion resistance of base metals "coated" with solid lubricants and the relative corrosion resistance of the base metals so treated is developed at considerable length.

Dr. A. K. Graham

Lowell C. Horwedel

R. W. Steinmetz

Dr. Walter R. Meyer

Francis X. Carlin

E. I. Weed

Barnet D. Ostrow

James K. Gore

Robert Seegmiller

Robert A. Ehrhardt

MAGNESIUM CORROSION

by E. I. Weed, Convair/Pomona, Convair Division of General Dynamics Corporation

Considerable progress has been made in the past ten years in the field of materials and processes for the corrosion protection of magnesium. These improvements include anodizing processes, plating processes and various organic coating materials. In spite of these improvements, the protection of magnesium when subjected to a corrosive environment continues to be a problem. This problem can be solved in most cases by intelligent use of protective mechanisms now available, attacking on three levels—engineering, production and quality control.

TUESDAY, JULY 26

9:00 a.m. ..... Golden State Room

SESSION C

6.—Dr. Russel E. Harr, Western Electric Company, Inc.

RECENT DEVELOPMENTS IN GOLD ELECTROPLATING

by Barnet D. Ostrow, Lea-Ronal, Inc.

A discussion of the new developments in gold plating with particular emphasis on application of such processes to industrial usage. The low *p*H type acid gold baths are discussed as well as a new high speed bright cyanide gold. Graphs, photomicrographs and tables of physical characteristics are presented.

A CYANIDE BATH FOR HEAVY GOLD PLATING

by James K. Gore and Robert Seegmiller, University of California, Los Alamos Scientific Laboratory

A cyanide gold plating bath capable of producing heavy gold deposits with good physical properties at rapid plating rates and reasonable temperatures is described. Designed for use in engineering applications, the bath produces bright to semi-bright, smooth, fine-grained, hard and relatively pore-free deposits, as rapidly as 1.5 mils/hr. Although the deposits are hard they are more ductile than most commercial bright golds. Smooth deposits 20–30 mils thick are readily obtained.

ACID GOLD PLATING

by Robert A. Ehrhardt, Bell Telephone Laboratories, Inc.

An acid gold plating bath developed for plating on printed circuits is described. It includes the study of the influence of *p*H, temperature, current density and bath composition on cathode efficiency and appearance. A porosity test was developed and used to determine the influence of the physical condition of the basis metal and of the various operating parameters on the porosity of thin gold deposits.

9:00 a.m. ..... West Garden Room

SESSION D

Chairman—*Dr. Richard B. Saltsonstall, The Udylite Corporation*

CORROSION AND ELECTRODE POTENTIAL STUDIES OF NICKEL-CHROMIUM SYSTEMS

by Arthur H. Du Rose, The Harshaw Chemical Company

A corrosion protection comparison for different systems of nickel-chrome deposits is given. It is shown that "duplex" nickel has much to offer in improved protection for plated parts. The correlation among various types of exposure tests is discussed. The outdoor corrosion weight loss for bright nickel foil is only slightly greater than that for sulfide-free nickel, but the degree of perforation is much greater, and chromium intensifies the perforation. Potential, galvanic and polarization data are given for bright nickel, sulfide-free nickel and chromium.

A PROGRESS REPORT ON EXPERIENCES IN IMPROVING THECORROSION RESISTANCE OF AUTOMOTIVE PARTS

by J. D. Thomas, D. W. Hardesty and C. F. Nixon, General Motors Corporation Research Laboratories

With improvement in the corrosion resistance of decorative plated finishing systems, the CASS test has been modified, especially as to the time required for testing because in its present form

Arthur H. DuRose

James D. Thomas

Donald W. Hardesty

Cleveland F. Nixon

R. J. Clauss

William H. Safranek

Hugh R. Miller

R. W. Hardy

Dr. Harold J. Read

Dr. Richard J. Barton

as much as 100 hours has been required to produce failure. Further experience now permits better correlation of CASS results with outdoor performance, particularly for plating capable of withstanding 16 hours or more of CASS exposure without failure. Changes in plating techniques which have resulted in improved corrosion resistance are discussed.

NEW DATA ON THE PERFORMANCE OF NICKEL AND CHROMIUM PLATED ZINC DIE CASTINGS

by W. H. Safranek, H. R. Miller, R. W. Hardy, and Dr. C. L. Faust, Battelle Memorial Institute

The results of research conducted for American Zinc Institute on procedures for improving electroplated zinc die castings have shown outstandingly better corrosion performance for die castings plated with 0.8 or 1.2 mils of duplex nickel and 0.05 mil of bright crack-free chromium in place of bright nickel-ordinary chromium composites. Greater resistance to cracking during thermal cycling was another advantage shown for duplex nickel. Higher impact values were obtained for die-cast zinc alloy when bright nickel was replaced by duplex nickel. Crack-free chromium eliminated the corrosion pitting that occurred in duplex nickel-ordinary chromium composites. In this respect, outdoor weathering confirmed the results of accelerated corrosion studies.

A STUDY OF VARIATIONS IN CERTAIN CHARACTERISTICS OF BRIGHT NICKEL DEPOSITS WITH VARIATIONS IN BATH TEMPERATURE

by R. J. Clauss, The Udylite Research Corporation

The effects of operating bright nickel solutions at temperatures above 175F have been studied and certain characteristics of the electrodeposit such as microstructure, appearance and ductility are compared with the properties of deposits made at normal plating temperatures. The effectiveness of various addition agents at these temperatures is compared to their utility at today's lower operating temperatures. Analogous properties of bright nickel deposited at elevated temperatures and bright nickel-cobalt alloy deposits are also discussed.

WEDNESDAY, JULY 27

9:00 a.m. ..... Golden State Room

SESSION E

Chairman—*Dr. Harold J. Read, The Pennsylvania State University*

THE METALLURGICAL ASPECTS OF HYDROGEN EMBRITTLEMENT IN METAL FINISHING

by Dr. Harold J. Read, Department of Metallurgy, The Pennsylvania State University

The practical problems of metal damage by hydrogen are outlined with emphasis on metal finishing aspects. The nature and extent of damage are discussed. Remedies are classified according to their application, that is, as modifications of the finishing processes to prevent hydrogen occlusion or as post treatments to remove occluded hydrogen. Selection of metals and finishes for specific applications is discussed in the light of hydrogen damage problems, and metallurgical information of assistance to metal finishers who must face embrittlement problems is presented.

ON THE MECHANISM OF TRANSPORT OF HYDROGEN ACROSS A SOLUTION-METAL INTERFACE

by Dr. Richard J. Barton, Wright Air Development Division, Wright-Patterson Air Force Base

The mechanisms of hydrogen entry into and release from metals are discussed in consideration of presently accepted mechanisms for the hydrogen electrode reaction. The applicability of these hydrogen evolution mechanisms to certain solutions and metals is conisdered. These mechanisms are analyzed, using various possible migrating species, to determine at which stage deviation from the gas evolution process may occur to cause hydrogen entry into the metal. The effects of the rates of various kinetic steps, the nature of the surface films and the amount of the surface coverage are evaluated and experimental evidence is cited. The influence that mechanisms of the release process may have upon penetration studies is pointed out.

S. C. Lawrence Jr.

Cloud A. Snavely

Norman M. Geyer

G. William Lawless

Bennie Cohen

C. C. Shepherd

Maynard L. Hill

Dr. Walter Beck

E. J. Jankowsky

Dr. W. F. Hamilton

Myron Levine

THE BEHAVIOR OF HYDROGEN IN IRON AND STEEL

by Maynard L. Hill, Westinghouse Electric Corporation Research Laboratories

Studies of the solubility and diffusivity of hydrogen in ferritic alloys have shown that the normal behavior above about 200C is for the hydrogen to dissolve interstitially. However, several pronounced deviations from this fundamental behavior have been observed at lower temperatures where embrittlement occurs. These indicate that the hydrogen no longer resides in interstitial sites, but instead, it segregates at sites of lower energy. Various possible types of segregation such as condensation around dislocations, molecular gas formation in voids, chemisorption in cracks and others are discussed along with the possible role of such segregations in the mechanism of embrittlement.

DETECTION AND CONTROL OF CHEMISORBED HYDROGEN DURING ELECTROLYSIS

by Samuel C. Lawrence Jr., Metal Physics Laboratory, Boeing Airplane Company

Instrumentation to detect and measure hydrogen entering plated parts during electrolysis is described, and data obtained from experiments employing these techniques have been applied successfully to keep chemisorbed hydrogen to a minimum. The relative importance of different "catalysts" or "poisons" on adsorption rates is shown, and proper control of voltage, temperature and other parameters allows satisfactory plating to be made with low hydrogen pickup. Adsorption during other portions of the electroplating process, such as liquid honing, cleaning, pickling, and rinsing can also be substantially reduced. These methods can be used for continuous, accurate monitoring of chemisorbed hydrogen.

2:00 p.m. ..... Golden State Room

SESSION F

Chairman—*Dr. Samuel Heiman, Philadelphia Rust Proof Company, Inc.*

MEASUREMENTS PERTAINING TO HYDROGEN EMBRITTLEMENT

by Cloyd A. Snavely, Battelle Memorial Institute

Measuring techniques which have been useful in hydrogen embrittlement studies are described, and their usefulness for future studies is critically examined. Included in the discussion are hydrogen charging methods, stressing methods, analytical problems, surface effects, and related phenomena. Problems in developing a standard embrittlement test are outlined.

A NEW LOOK AT THE HYDROGEN EMBRITTLEMENT OF CADMIUM COATED HIGH STRENGTH

by Norman M. Geyer, G. William Lawless, and Bennie Cohen, Materials Laboratory, Wright Air Development Center, Wright-Patterson Air Force Base

A sensitive embrittlement test consists of a sustained loaded notched tensile specimen, loaded at 75 per cent of the ultimate notched tensile strength for a minimum of 200 hours. Detrimental hydrogen embrittlement is shown to be dependent upon the steel alloy, the current efficiency of the cadmium plating bath and the physical structure of cadmium coating obtained. Cadmium electroplating processes for coating high strength steel without detrimental hydrogen embrittlement are given.

EFFECTIVENESS OF METALLIC UNDERCOATS IN MINIMIZING PLATING EMBRITTLEMENT OF ULTRA HIGH STRENGTH STEEL

by Dr. Walter Beck and E. J. Jankowsky, Naval Air Material Center, Aeronautical Materials Laboratory

Effective reduction of hydrogen embrittlement of ultra high strength steel resulting after chromium and cyanide cadmium electroplating was achieved by pyrophosphate copper and Watts type nickel undercoats and replacement of the cyanide cadmium plating solution by the fluoborate bath. Embrittlement was evaluated by measurements of bend and tensile ductilities and sustained-loading delayed-failure tests on notched specimens. The sustained-loading test exceeds the other two procedures in sensitivity and reliability. Mechanisms were suggested for embrittlement inhibition by metallic undercoats and replacement of the cyanide by the fluoborate solution and the experimental results discussed in the light of these mechanisms.

Paul Glab

R. S. Modjeska

Simon P. Gary

Dr. D. E. Koontz

Dr. David O. Feder

Dr. Carl O. Thomas

Dr. Victor Zentner

Richard C. Barrett

Morton Schwartz

Robert J. Girard

Edward F. Koetsch Jr.

CONTROL OF HYDROGEN EMBRITTLEMENT BY PLATING FROM CADMIUM CYANIDE BATHS CONTAINING NITRATE

by Dr. W. F. Hamilton and Myron Levine, Lockheed Aircraft Corporation, California Division

A modification of the conventional electroplating process has been developed by which the plating of high strength steel parts can be satisfactorily accomplished without harmful hydrogen embrittlement. Addition of sodium nitrate and a throwing power additive to a high cadmium, low free-cyanide electrolyte produces satisfactory operating characteristics without visible cathodic gassing. The need for post plate baking is eliminated. A new cleaning procedure has been developed for use with the modified electrolyte and the operation, control, testing and results of the process are given.

7:30 p.m. ..... Los Angeles Room

ROUND TABLE SESSION

Chairman—Dr. Harold J. Read, The Pennsylvania State University

HYDROGEN EMBRITTLEMENT IN METAL FINISHING

THURSDAY, JULY 28

6:00 a.m. ..... Golden State Room

SESSION G

Chairman—Dr. Abraham M. Max

MAGNETIC PROPERTIES OF ELECTRODEPOSITED COBALT ALLOYS

by Dr. Victor Zentner, Hughes Aircraft Company

The performance of permanent magnets depends primarily on the magnitude of the coercive force and remanence of the magnetic material. The correlation of these two properties with plating conditions in electrodeposited cobalt-nickel and other binary cobalt alloys were investigated. Photographs of hysteresis curves taken with the aid of a B/H loop tracer which displays these curves visually on an oscilloscope show the influence of conditions of deposition on these magnetic properties. Corroborative evidence for the magnetic behavior of these alloys is shown by saturation curves obtained by plotting writing currents for signals at various frequencies against readback voltage. Preferred conditions of deposition for producing alloys with desirable magnetic properties have been established.

PLATING OF NICKEL, COBALT, IRON AND CADMIUM FROM SULFAMATE SOLUTIONS

by Richard C. Barrett, Barrett Chemical Products Company

Technical data are given on the application and properties of nickel electrodeposited from sulfamate solution, with particular emphasis on high temperature applications of deposits, special magnetic properties of nickel-cobalt and nickel-iron alloys. Hydrogen embrittlement aspects of cadmium deposition at 100 per cent cathode efficiency in sulfamate plating baths are discussed. Bath formulae and operating conditions covering the electrodeposition of cobalt, iron, and cadmium from sulfamate solutions are included.

THE CHEMICAL REDUCTION OF NICKEL-PHOSPHORUS ALLOYS FROM PYROPHOSPHATE SOLUTIONS

by Morton Schwartz, Kelite Corporation

New electroless nickel solutions using pyrophosphate complexing agents have been developed. These alkaline pyrophosphate solutions can be operated at temperatures lower than normally employed, with higher deposition rates. The solutions are stable and easily maintained and controlled. Deposition rates of 0.5 to 0.7 mil/hr have been obtained at 68 to 74C. The composition of the deposit is constant at 5 per cent phosphorus over a wide range of operating conditions. The effects of the important variables are discussed.

9:00 a.m. ..... West Garden Room

SESSION H

Chairman—Francis T. Eddy, Tel-autograph Corporation

SOLUTION TRANSFER IN BARREL PLATING

by Paul Glab, R. Scott Modjeska and Simon P. Gary, Scientific Control Laboratories, Inc.

Results are presented of a study of solution changes within a plating barrel occurring during the plating period and the effects of those changes in deposit characteristics, plating rates, etc. A barrel is immersed in clear water with a soluble dye added to the barrel. Color dilution measurements show quantitative rate of solution transfer. Types of loads, perforation sizes and barrel speeds are varied. Studies in actual production in cadmium, copper, nickel, silver, tin, zinc, and brass show metal ion concentration variation within the barrel from start to cycle completion.

CLEANING TECHNIQUES IN THE ELECTRONICS INDUSTRY

by Dr. D. E. Koontz, Dr. D. O. Feder and Dr. C. O. Thomas, Bell Telephone Laboratories, Inc.

Trace amounts of extraneous materials may significantly influence either the electrical characteristics or the feasibility of fabrication of modern electronic devices. Current trends in the electronics industry which have created a need for more effective control over both the type and amount of residual contaminants are described. Contaminants are classified and examples are presented of their effects on the performance of typical devices. Practical techniques developed for the detection, removal and control of contaminants are described. Cleaning techniques and their integration into typical cleaning cycles of interest to electroplaters are presented.

CHROMIUM PLATING OF RIFLE BARRELS

by Robert J. Girard and Edward F. Koetsch Jr., Springfield Armory

The process for chromium plating the M14 barrel has advanced to a production stage at Springfield Armory. This paper discusses the methods employed in the development and adaptation of a process to electropolish and chromium plate the entire bore and chamber of the M14 Springfield Rifle. Electropolishing and chromium plating processes are outlined, including processing equipment and procedures, bath compositions, fixture design and maintenance, semiautomatic bore-cleaning operations, gaging of barrels, time guides for controlling electropolishing and chromium plating, and the relationship of viscosity and temperature to the degree of taper obtained during electropolishing.

2:00 p.m. ..... Golden State Room

SESSION I

Chairman—Maurice R. Caldwell, Doehler-Jarvis Division, National Lead Company

AES RESEARCH—ITS PURPOSE AND ACCOMPLISHMENTS

by J. D. Thomas, 1959–1960 Chairman, AES Research Committee

The reasons for sponsoring research, the aims in selection of areas to be studied, and benefits to be gained are discussed. Financial support is obtained from Active Members, Sustaining Memberships, and donations from Branches and other Societies. A brief review is given of the presently active projects and those which have been completed. What the future promises is contemplated in view of the rapid changes taking place in the metal finishing industry.

CORROSION PROTECTION WITH DECORATIVE CHROMIUM

by Dr. E. J. Seyb, Metal & Thermit Corporation

During recent years there have been dramatic advances in the concept of chromium's role in corrosion protection with copper-nickel undercoats. Previously, chromium was not considered in providing corrosion protection, and was used primarily for tarnish resistance. It is now recognized that chromium is a major factor in providing improved corrosion protection. The improvement is obtained by means of greater thicknesses of crack-free or duplex chromium. These different chromium deposits are discussed, and their corrosion protection illustrated by accelerated and outdoor exposure tests. Industrial applications are described.

EXPERIENCE IN THE OPERATION AND PERFORMANCE OF DUAL CHROMIUM SYSTEMS

by W. E. Lovell, E. H. Shotwell and James Boyd, Ternstedt Division, General Motors Corporation

Dual chromium plating has been practiced on a production scale for about two years, and is shown on the basis of accelerated and outdoor exposure tests to provide markedly improved corrosion resistance over the single chromium system formerly used. Methods of applying dual chromium, and problems encountered, are discussed. Theory explaining the improvement in corrosion resistance obtained by dual chromium is developed, including illustrations of desired crack patterns, potentials of electrodeposited metals and techniques used for their measurement, and the mechanisms of corrosion in single and dual chromium systems.

Dr. Charles L. Faust

Dr. E. J. Seyb

William E. Lovell

Eldon H. Shotwell

James Boyd

CONVENTION CHAIRMEN

Mrs. Glen J. Beckwith
Ladies

Tony Stabile
Chairman

George J. Hetz
Vice Chairman

Walter P. Behlendorf
Finance

Lawrence M. Henderson
Hotel

Harvey K. Hunt
Plant Visits

C. Phillip Simon
Registration

Eugene Bosl
Children

Earl W. Arnold
Educational Sessions

G. Stuart Krentel
Printing

Mrs. Alice M. Prescott
Secretary

William P. Thomas
Banquet

L. Truman Stoner
Outing

E. W. Wells
Publicity

Lawrence O'Neil
Entertainment

John D. Millhorn
Program

Norman F. Painter
Housing

AMERICAN ELECTROPLATERS' SOCIETY CONGRATULATES AND THANKS

THE EXCLUSIVE mission of American Electroplaters' Society, Inc. (AES), for five full fruitful decades, has been, and continues to be, the advancement of electroplating, metal finishing and allied arts through the enrichment of knowledge. Like every other AES National Convention since the first as such held in 1913, the principal purpose of the AES's 47th Annual Convention being held in Los Angeles, July 24–28, 1960 is to share technical and scientific knowledge in plating, metal and organic finishing and allied arts.

ASIDE FROM an Educational Sessions Program expected to be among the most significant in AES's long convention history, the 47th Annual Convention has marshaled an array of "off duty hour" programs of relaxation, fellowship and entertainment expected to compare favorably with any previous AES Convention, particularly since these events are to occur against Los Angeles' unique vacationland background.

TO THE state, municipal and civic leaders of California and Los Angeles who are welcoming AES to their great state and city, July 24–28—to the officers and members of the Society's Los Angeles Branch that is hosting this large AES enterprise—to the fine industrial companies that have advertised in this Convention Issue of PLATING MAGAZINE and/or that are providing hospitality at the Convention—to the leadership and personnel of the Host Branch Convention Committee—to the executives and staff of the Statler Hotel and other Los Angeles hostelries that are housing the Society's large numbers—to these, plus the learned men who will share their knowledge with AES's members attending the Educational Sessions, the Supreme Society, the Executive Board, National Headquarters and PLATING MAGAZINE express a hearty "thank you."

AND TO AES's attending membership, may your cup overflow with technical and scientific knowledge, and may you have much fellowship and fun in America's West Coast "Wonder City," July 24–28, 1960, AES Convention style.

E. A. Blount
Treasurer

F. P. Green
1st Vice President

R. F. Ledford
President

J. G. Carrique
2nd Vice President

H. L. Kellner
3rd Vice President

METAL FINISHING SUPPLIERS' ASSOCIATION

HOTEL STATLER, LOS ANGELES, CALIFORNIA

A. P. Munning
Executive Secretary

SUNDAY, JULY 24
11:30 a.m.—Branch and Board of Trustees Meeting ..... Buffalo Room

MONDAY, JULY 25
12 noon—Luncheon and Annual Meeting ..... Sierra Room
8:00 p.m.-midnight—Ball. Continuous Music for Dancing. Refreshments and Snacks ..... Pacific Ballroom & Sierra Room
(Admittance by AES Convention Registration Badge)

TUESDAY, JULY 26
8:30 a.m.—Golf Tournament ..... Los Coyotes Country Club, Buena Park

THURSDAY, JULY 28
6:00-7:00 p.m.—Host to Cocktail Party ..... Wilshire Room

Earl W. Couch
Past President

NATIONAL ASSOCIATION OF METAL FINISHERS

HOTEL STATLER, LOS ANGELES, CALIFORNIA

A. T. Leonard
President

THURSDAY, JULY 21
9:00 a.m.-5:00 p.m.—Board of Directors Meeting
6:00-10:00 p.m.—"Let's Get Acquainted" ..... Studio Bar

FRIDAY, JULY 22
9:00 a.m.-5:00 p.m.—Registration ..... Mezzanine
9:30 a.m.—Ladies and Children go to Marineland ..... Bus from Statler
9:30 a.m.-12 noon— Annual Membership Meeting & Election of Directors ..... Sierra Room
1:30-5:30 p.m.—Board of Directors Meeting & Election of Officers ..... Washington Room

SATURDAY, JULY 23
9:30 a.m.-12 noon—Registration ..... Mezzanine
9:30 a.m.—Tour of World—Farmers' Market. Lunch & Fashion Show at Beverly Hilton Hotel, Hollywood ..... Bus from Statler
9:30 a.m.-5:00 p.m.—Three Management Seminars ..... Los Angeles Room
6:30-8:30 p.m.—Registration ..... Entrance, Sierra Room
7:00 p.m.—Reception & Cocktail Party ..... Sierra Room
8:00 p.m.—Banquet ..... Sierra Room
9:30 p.m.—Dancing, Floor Show & Entertainment ..... Terrace Room

SUNDAY, JULY 24
6:00 p.m.—Public Relations Dinner Meeting

MONDAY, JULY 25
8:30 a.m.—Breakfast Meeting—Local Association Secretaries
9:30 a.m.—Tour of Hollywood and a Movie Studio ..... Bus from Statler
10:30 a.m.—Plant Tour of Crown City Plating, Sanford Process Co., Modern Plating and Burton Silver Plating ..... Bus from Statler

TUESDAY, JULY 26
2:30 p.m.—Trip to Disneyland ..... Bus from Statler

Harold E. Coombes Sr.
General Chairman

George W. Taylor
Past President

Harold E. Coombes Jr.
General Co-Chairman

Sal Novelli
Ass't. Secretary
Treasurer

Robert L. Giesel
1st Vice President

Edward N. Marlette
2nd Vice President

Frank Kaiser
Secretary-Treasurer

P. Peter Kovatis
Executive Secretary

AES NEWS

TWO EDUCATIONAL SESSIONS ATTRACT CROWD TO TRI-STATE

Cincinnati Branch hosted the Tri-State Regional Sixth Annual Educational Sessions and Dinner-Dance at the Hotel Sheraton-Gibson, Cincinnati, on Saturday, April 23. It was one of the best attended of the Tri-State meetings and, as the first one was held in Cincinnati, the Sixth Annual Meeting marked an auspicious return to the city of Tri-State's origin.

Morning and afternoon educational sessions were held for the first time with gratifying attendance of some 200 members and guests at both sessions. AES National President Ralph D. Wysong was honorary chairman of the widely diversified program. He was introduced by David L. Kaplan, educational chairman.

Two papers were presented at the morning session. "Personnel in Plating" was the subject of the talk by Robert L. Giesel, president of Adolph Plating, Inc. The research programs of the SAE, ASTM and, in greater detail, the AES were presented by James D. Thomas of General Motors Research Laboratories and chairman of the AES Research Committee. His paper was entitled "Corrosion Resistance of Decorative Plates."

During the afternoon session, "Waste Disposal" was presented by George E. Barnes and Leon W. Weinberger, Case Institute of Technology. John F. Harper, president of Harper Buffing Machine Co., explained "The Harperizer—A New and Fresh Approach to Problems of Mechanical Finishing." Mr. Harper is a Charter Member of AES New Haven Branch. In a lighter vein, Dr. Abner Brenner of the National Bureau of Standards described his "Visit to Moscow", illustrated by three-dimensional slides.

A cocktail reception, provided by 44 suppliers, preceded the dinner-dance. Nearly 600 attended the evening affairs.

Lee J. Howald was the general chairman. The Tri-State Region representatives are: Lee J. Howald, Gerard H. Poll Jr., Cincinnati; Hans Gernes, C. G. Smith, Columbus; Holle Luechauer, Lawrence Hadlock, Dayton; Quentin Shockley, Bert Hawhee, Indianapolis; K. C. Reifsteck, James Smith, Louisville; Robert Bruck, treasurer.

Columbus Branch will host the Seventh Annual Tri-State Regional Meeting at the Deshler-Hilton Hotel, Columbus, on February 4, 1961. C. G. Smith is general chairman.

LOS ANGELES CONVENTION EDUCATIONAL SESSIONS PROGRAM FINALIZED BY EDITORIAL BOARD

At its meeting in Cincinnati, Ohio, Friday, April 22, the Society's Editorial Board considered and approved the final Educational Sessions Program of the 47th Annual Convention to be held at the Statler Hotel, Los Angeles, California, July 24–28, 1960, with the Los Angeles Branch as Host, as spearheaded by the Host Branch Educational Program Committee headed by Earl W. Arnold, with David F. Seymour as Co-Chairman.

Aside from the Opening Educational Session that will feature "The Second Annual William Blum Lecture," the final program as approved embodies 9 sessions and 31 technical papers. Session-by-session, these papers and their authors are not only identified in the Convention Program presented on Pages 682 and 683 of this issue of PLATING MAGAZINE but which, with actual abstracts of each of the papers, are also spelled out fully on Pages 685 to 690.

Sessions Chairmen appointed include Dr. William Blum (Opening); Dr. Harold J. Wiesner (A); Herberth E. Head (B); Dr. Russel E. Harr (C); Dr. Richard B. Saltonstall (D); Dr. Harold J. Read (E); Dr. Samuel Heiman (F); Dr. Abraham M. Max (G); Francis T. Eddy (H) and Maurice R. Caldwell (I).

Among other business transacted, the Board endorsed a Symposium on "The Finishing of Light Metals" to be conducted at the Society's 48th Annual Convention, Boston, Massachusetts, June 18–23, 1961. Host Branch Educational Program Chairman George J. Marotta, present at the Board's Cincinnati meeting, provided a status report on Boston's Educational Sessions plans upon which the Board will commence action at its July 25 Los Angeles meeting. He announced to the Board, the appointment of his Co-Chairman, namely Charles Levy of the Gillette Safety Razor Company.

The Board also endorsed a recommendation made to it by the Paper Awards Committee, and adopted a "sense of the meeting" resolution suggesting to the Executive Board that the Executive Board spearhead the establishment of an Annual Paper Award for the best paper published in PLATING MAGAZINE or TECHNICAL PROCEEDINGS during the fiscal year on the subject of organic coating, and that that Board invite suitable company sponsorship for such an annual award.

Besides Chairman John P. Nichols who presided and Rodney Leeds, secretary, Board members present at the Cincinnati meeting included Robert A. Ehrhardt, Dr. Henry L. Kellner, James H. Lindsay, Dr. Abraham M. Max, Dr. Joseph V. Petrocelli and William H. Safranek.

SOCIAL EVENT AND BUSINESS AT TRI-STATE REGIONAL. (Left) Mrs. Wysong, AES National President Ralph D. Wysong, Mrs. Howald, General Chairman Lee J. Howald. (Right) Attentive audience at one of the Educational Sessions.

A E S's LIVING FOUNDERS

Harry C. Bernard
New York Branch

Justus A. Stremel
New York Branch

Edward W. T. Faint
Newark Branch

Frederick F. Pierdon
Baltimore-Washington Branch

OBERLAND ANNOUNCED AS CANDIDATE FOR AES THIRD VICE PRESIDENT

The candidacy of Edward E. Oberland, President of the Baltimore-Washington Branch, for the office of Third Vice President of American Electroplaters' Society, Inc. has just been announced by that Branch. Consequently, his name, along with at least two previously announced aspirants of other Branches for that national office will reportedly be placed into nomination at the Annual Meeting of the Supreme Society to be held in Los Angeles, July 28, 1960.

A graduate of the University of Wisconsin, Mr. Oberland is a Chemical Engineer who, for many years has been associated with the Western Electric Company in Chicago, New York and Baltimore. For eight years, he has been Senior Development Engineer responsible for planning and development in electroplating, metal cleaning and organic finishing at the Baltimore plant of that Company.

Long a member of the American Electroplaters' Society, his distinguished record includes long service as a Delegate of the Baltimore-Washington Branch and as an Officer of that Branch through the various echelons from Branch Librarian to Branch President. Also active in civic affairs, his management and supervisory qualifications include service as Executive Secretary of the Industrial Management Society during his Chicago residence.

Edward E. Oberland

AES THANKS . . .

The Univertical Corporation of Detroit, for some time, has been supporting one Sustaining Membership at the usual $100 Sustaining Membership rate. When its invoice was issued in March for 1960–1961 Sustaining Membership, the company's check came back promptly—not for one $100 membership but for three $100 memberships. And hardly had the AES's letter of warm appreciation to Charles T. Walker, Company President, issued than another check reached Headquarters from Mr. Walker via Mr. Kubis—this one for $200 more thereby increasing Univertical's memberships from three to five.

To Univertical, the AES and the Research Program express a warm "thank you".

OPPORTUNITY TO AUTHORS INTERESTED IN BOSTON CONVENTION PARTICIPATION

Emphasis being placed in programming the AES's Annual Convention to occur in Boston, Massachusetts, June 18-23, 1961, is upon creating an educational program so significant and appealing, that few persons seriously interested in educational enrichment in electroplating, metal finishing, organic coating and other such subjects can afford to miss it.

Members or non-member authors of original, unpublished technical and scientific papers on electroplating, metal finishing, organic coating and allied arts wishing to be considered as prospective participants in that Boston educational program are cordially invited to communicate either with Host Branch Educational Chairman George J. Marotta direct (Address: 91 Argilla Road, Andover, Massachusetts) or through the Editor of PLATING MAGAZINE, 443-445 Broad Street, Newark 2, New Jersey.

The Editorial Board will consider the preliminary program at its meeting in September 1960. You are consequently urged to record your availability with Mr. Marotta forthwith. State your subject (and send a preliminary abstract if possible) but please do not submit any manuscript until after the full particulars as to specifications have been sent to you.

MILWAUKEE ANNUAL MEETING FEATURES GILBERT AT TECHNICAL SESSION

The 1960 Annual Meeting of the Milwaukee Branch was held Saturday, April 30, at the Schroeder Hotel in Milwaukee.

The meeting started with a luncheon in the Empire Room, after which Branch President Sy Taterzynski introduced Ralph D. Wysong, AES National President.

Leslie L. Diveley acted as technical chairman and introduced the guest speaker, Lloyd Gilbert of the Rock Island Arsenal. He spoke on the subject, "How Design Influences Finishing, or Things that Shouldn't Happen to the Metal Finisher", developing the theme that many field failures evolve from the failure of the design engineers to consider finishing problems. He displayed many samples to illustrate his points. Among the samples were zinc die castings with extreme recesses causing contamination problems; aluminum and magnesium castings with steel inserts given electrolytic treatments; aluminum and magnesium parts subjected to severe galvanic corrosion because of dissimilar metal effect; parts that were impossible to drain or rack. He also spoke of the failure to properly stress relieve hardened steel. Mr. Gilbert concluded by pointing out that the failures were due to poor communication between designers and metal finishers, and that a real effort must be made to provide designers with proper information.

The metal finishing suppliers staged a very successful cocktail party prior to the evening banquet. The dinner menu was highly acclaimed. The Obert-Anthony Orchestra and Chorus, featuring 52 talented musicians, singers, and dancers, provided entertainment. Dancing continued until the early hours of the morning.

E. H. McCoy was general chairman of the meeting.

AES LAPEL BUTTONS

The AES members handsome silver lapel button can be purchased from your Branch Secretary at $1.38 per button.

21st Annual New England Regional Educational Meeting in session at the Hotel Statler, Hartford, Connecticut, on April 23.

NEW ENGLAND MEETING USHERS IN THAT REGION'S DYNAMIC NINTEEN SIXTIES

The theme of AES's 21st New England Regional Meeting held at the Hotel Statler, Hartford, Connecticut, April 23, 1960, sponsored by the Society's Bridgeport, Hartford, New Haven, Springfield and Waterbury Branches with a record audience present, was well keynoted by Allen Ferguson, General Chairman and President of the Host Bridgeport Branch.

"We are a large and growing segment of the industrial might of our country," he wrote in the event's splendid 60-page printed program. "A vastly important part, we have contributed much and will contribute more to the technical skill of which we are so proud. Your Committee hopes that the program today has contributed to the idea of promoting an enthusiastic approach to the 'start of the Sixties' . . . We hope that this regional meeting will be a stepping stone to the best ten years of our industry."

The educational program featured the paper "Precision Barrel Finishing" by Hubert M. Goldman of Enthone, Inc. and the paper "Modern Trends in Nickel Plating" by Jack D. Little, Incar, Inc. Meanwhile, the ladies were treated to a nifty game of Bingo in the Terrace room with prizes galore.

Then the huge attendance converged upon the Ballroom for an auspicious Cocktail Party hosted by seventeen of the industry's sources of supply. The Banquet that followed packed that same Ballroom. Dancing till the morning's early hours followed to the tuneful music of William Glenny's Orchestra.

Aside from the Bridgeport Branch that hosted the event, the Waterbury Branch handled publicity; New Haven, the educational program; Springfield, the entertainment and Hartford, the program advertising.

(Left) Crowded Ballroom during the New England Regional Annual Banquet. (Right) The Ladies played Bingo while the men attended the Educational Meeting.

CHAIRMEN AND TECHNICAL SPEAKERS FOR THREE ANNUAL REGIONAL MEETINGS

(Left) Tri-State at Cincinnati, April 23. L to R, James D. Thomas, General Motors Research Laboratories; Dr. Abner Brenner, National Bureau of Standards; Lee J. Howald, general chairman; David L. Kaplan, educational chairman; Robert L. Giesel, Adolph Plating, Inc.; Ralph D. Wysong, AES National President and honorary chairman; Leon W. Weinberger, Case 'nstitute of Technology; John F. Harper, Harper Buffing Machine Co.; George E. Barnes, Case Institute. (Center) New England at Hartford, April 23. Walter J. Dyber, Hartford Branch, program advertising chairman; Elery C. Gibson, Springfield Branch, entertainment chairman; Allen Ferguson, Bridgeport Branch, chairman Host Branch Committee; Francis A. Schneiders, Waterbury Branch, publicity chairman; George F. O'Connor Jr., New Haven Branch, educational chairman. (Right) Empire State at Elmira, April 29–30. Austin Fletcher, inorganic session moderator; C. F. Emery, president, Southern Tier Branch; John F. Jumer, Electro-Glo Co.; M. Maher, organic session moderator; Richard C. Barrett, Barrett Chemical Products Co.; J. D. MacQueen, International Business Machines Corp.; Dr. Edward B. Saubestre, Enthone, Inc.; Dr. M. W. Westgate, Gardner Laboratory; Dr. Harold Narcus, Electrochemical Industries, Inc.

EMPIRE STATE REGIONAL COMBINES EDUCATION WITH FUN AT ANNUAL AFFAIR

A costume barn dance ushered in the two-day Sixth Annual Empire State Regional Meeting at the Mark Twain Hotel in Elmira, N. Y., for which Southern Tier was the host Branch on April 29 and 30. The barn dance proved to be a hospitable way to start a meeting attended by members of a number of Branches.

The men's golf tourney on Saturday morning was dampened, but not halted, by April showers. Concurrent Inorganic and Organic educational sessions were held Saturday afternoon. General Co-Chairman S. C. Stefanski introduced the Mayor of Elmira, Edward Mooers, who welcomed the platers to the Southern Tier city.

Austin Fletcher moderated the Inorganic Session at which three excellent papers were presented. John F. Jumer of Electro-Glo Company talked on "Electropolishing of Metals." Richard C. Barrett, Barrett Chemical Products Company, described the "Sulfamate Nickel Plating Process." Dr. Edward B. Saubestre of Enthone, Inc. presented "Printed Circuits." Dr. Harold Narcus collaborated with him during the question-and-answer period following the paper.

The Organic Session was moderated by M. Maher. The three informative papers presented were: "Electostatic Coating" by Dr. E. P. Miller, Ransburg Electro-Coating Corporation; "A Review of Testing Techniques Used by the Paint, Varnish and Lacquer Industry" by Dr. M. W. Wingate, Gardner Laboratory, Inc.; and "Vinyl Finishes—Their Uses and Applications" given by J. D. MacQueen of International Business Machines Corporation.

Following a smorgasbord luncheon, the ladies boarded two buses and were taken for a tour of the Corning Glass Center.

Eighteen suppliers hosted a cocktail hour prior to the banquet, which was held in the main ballroom and terrace. Co-Chairman Stefanski presided at the banquet and introduced the committee chairmen and the guests at the double-tiered dais, among whom were three National Officers of the AES: First Vice President W. Andrew Wesley, Second Vice President Chester G. Borlet and Third Vice President Manuel Ben. Golf trophies were presented by Al Korbelak to the 18-hole winner Frank Tindale, Rochester Branch, and the 9-hole winner, George Zurenda, Southern Tier. Entertainment was provided by the "Twelmirans" girls choral group from Elmira College. Dancing continued 'til the early morning hours.

RESEARCH COMMITTEE FINALIZES 1960-1961 AES PROGRAM AT ELMIRA MEETING

Meeting at the Mark Twain Hotel, Elmira, New York, April 28, the AES Research Committee, with Chairman James D. Thomas presiding, not only finalized the AES's 1960–1961 Research Program but also adopted its 1960–1961 budget subject to ratification by the Research Annual Meeting to be held on July 27 in Los Angeles, during the Society's 47th Annual Convention.

As enacted, the 1960–1961 AES Research Program continues Project No. 12 (Columbia University); Project No. 14 (Ontario Research Foundation); Project No. 15 (Detroit Area); Project No. 16 (University of Pennsylvania) and Project No. 18 (Chicago Area). Both Project No. 13 (National Bureau of Standards) and Project No. 17 (Virginia Institute of Scientific Research) have been completed effective at the conclusion of the current fiscal year. To succeed them, the Committee is negotiating a Project at the National Bureau of Standards on the subject of the "Galvanic Effects Associated with Coating Failures" to be designated as Project No. 19. It hopes also to create a cooperative Project in the Southwest Area focused upon some important phase of aerospace metal finishing, perhaps "Plating by Thermal Decomposition." This Project will be termed Project No. 20.

Two Serial Reports (No. 40 and No. 41) have already been issued this fiscal year, and three more, namely Serial Reports Numbers 42, 43 and 44, will issue to all Sustaining Members and others before fiscal year-end.

In addition to the enacted AES Research Program for 1960–1961, the Research Committee also authorized the establishment of task committees to explore the desirability of creating Projects on such subjects as, 1) "Physical Properties of Copper," 2) "Ion Exchange for the Removal of Inorganic Impurities of Plating Solutions," 3) "Organic Coating" and 4) "Physical Properties of Precious Metal Coatings."

The Committee also completed plans for the staging of its Annual Meeting on July 27. This will be launched with a breakfast meeting to be attended by National Officers, members of the Research Committee, District Supervisors, Regional Research Finance Chairmen; Project Chairmen, Directors and other Project personnel, Past Research Committee Chairmen and others. The Committee will there develop its final plans for its aggressive Sustaining Membership increase program.

Members of the Committee present at the Elmira meeting, besides Chairmen Thomas, were Glade B. Bowman, Donald Foulke, Edward J. Kubis, Raymond L. Mitchell, W. E. Moline, John P. Nichols and Kergan Wells.

SOUTHERN TIER BRANCH HOSTS EMPIRE STATE REGIONAL MEETING. (Left) Frivolity at the Barn Dance. (Center) Empire State Regional Board: Frank O. Beuckman, Rochester; John L. Martin, Buffalo; Milton F. Stevenson, Syracuse; Rolland Campbell, Buffalo; Morgan D. Rake, Southern Tier; Fred C. Thiem, Rochester; Jack Benson, Mohawk Valley; Merle Ihrie, Mohawk Valley. Present, but just beyond the range of the camera, Rene Sonnenfeldt, Syracuse. (Right) Double-tiered head table at the banquet.

TO BRANCHES AND BRANCH SECRETARIES

1. A Return Sheet listing your Branch's accredited Delegates and Alternate Delegates has been sent to you. Via that Return Sheet, you are expected to specify those accredited Delegates and/or Alternates who will be at the Los Angeles Convention to represent you in the deliberations of the Supreme Society. If none of your own Delegates or Alternates surely intend to attend the Convention, you have been asked to select and specify three choices among other Branches from which you wish the Credentials Committee to select one and vest your Branch's proxy in it. Your Return Sheet, to be acceptable to the Credentials Committee, must be signed by your Branch President and Branch Secretary. (Reference: AES Constitution Part I, Art. III, Sections 1 and 2). Due date by or before June 1.
2. A complete, certified Roster of your Branch Members in good standing as at June 30, 1960 must be in the hands of the National Executive Secretary on or before July 15, 1960. Upon arrival, his office will properly bill your Branch for Per Capita Taxes covering the fiscal year July 1, 1960–June 30, 1961. Due date for full payment of Per Capita Tax is September 1, 1960. (Reference: AES Bylaws Part I, Art. V, Section 3).
3. There are available to you through National Headquarters, 1) The new gatefold Branch Membership combination promotion leaflet and application blank (Free limited quantities); 2) The vaunted booklet, "Milestones of AES" (Free) and 3) AES silver lapel buttons at $1.38 apiece and AES silver Branch Past President buttons at $1.43 apiece.

OTHER HAPPENINGS ON MILWAUKEE BRANCH'S "BIG DAY", APRIL 30

by

Leslie L. Diveley

Midwest Regional Council

The Midwest Regional Council met on Saturday morning, April 30, at the Schroeder Hotel in Milwaukee, Wisconsin.

Eugene Roth of South Bend reported on the plans for the Second Annual Conference, which will be held October 29 at the University of Notre Dame.

Herman A. Tessman reported on all plans for the 1962 Convention as far as they have been developed.

George F. Parisho, Regional Research Finance Chairman, displayed a sample of selling kits which he is preparing for the Branch Sustaining Membership Chairmen.

Decisions were made concerning the presentation of symposia at the 1962 Convention and the 1962 Regional Conference.

1962 Convention Committee Activated

The Steering Committee for the 1962 Convention met Friday, April 29th. The Convention will be held in Milwaukee and sponsored by the Midwest Regional Council. Herman Tessman of Milwaukee is the General Chairman, and Leonard Weeg of Rockford and Eugene Roth of St. Joe Valley are Co-Chairmen.

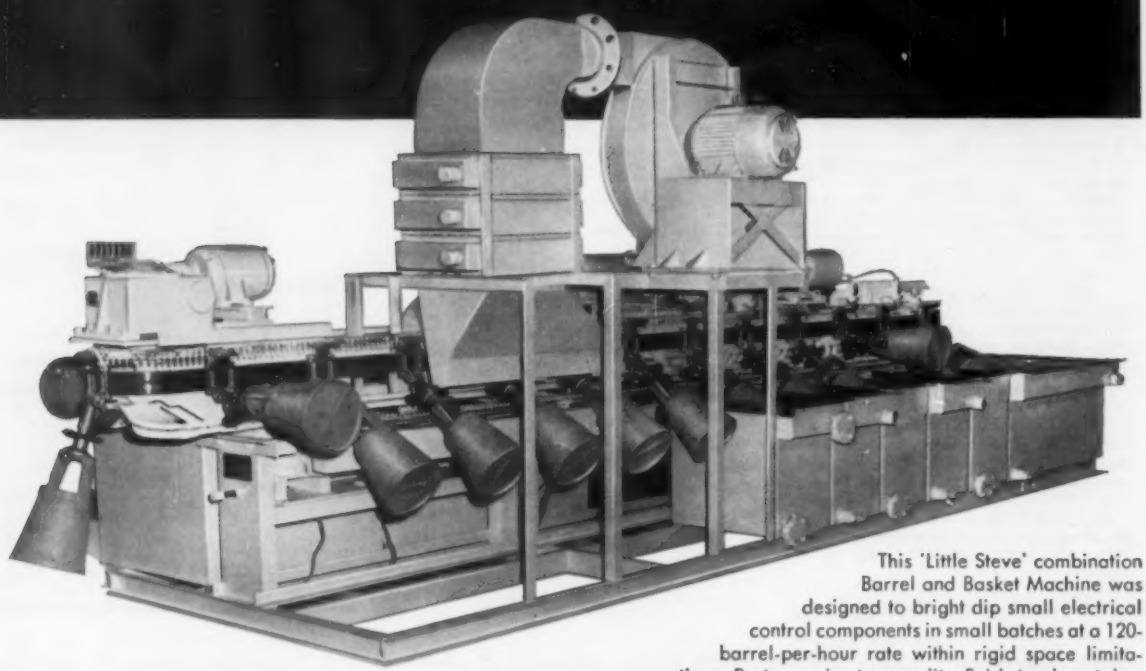
Saturday afternoon, April 30, all of the Chairmen of the Committees thus far appointed met for general planning. An effort will be made to streamline and offer a very modern convention and still maintain the atmosphere of the "gemutlichkeit" characteristic of Milwaukee.

AES BOARD AND COMMITTEE MEETINGS AT 47TH ANNUAL CONVENTION

		Room	Presiding
SUNDAY, JULY 24			
9 a.m.	Executive Board	Dallas	Ralph D. Wysong
2 p.m.	Honorary Membership Award Committee	Washington	Leslie L. Diveley
3 p.m.	AES Scientific Achievement Award Committee	St. Louis	Dr. Henry B. Linford
4 p.m.	Credentials Committee	Dallas	Arthur W. Logozzo
MONDAY, JULY 25			
12 p.m.	Branch Secretaries	New York	John P. Nichols
2:30 p.m	Editorial Board	Boston	John P. Nichols
2:30 p.m.	Midwest Regional Council	Dallas	Leslie L. Diveley
4:00 p.m.	Order of Past Presidents	Detroit	Dr Samuel Heiman
TUESDAY, JULY 26			
8 a.m.	Proctor Award Selection Committee	Boston	Ralph D. Wysong
9 a.m.	Membership Committee	Washington	M. Lester Reynolds
9 a.m.	Public Relations Committee	Detroit	Robert M. Norton
9 a.m	outhwest Regional Council	Dallas	M. E. Browning, Jr.
WEDNESDAY, JULY 27			
8 a.m.	Research Committee Breakfast	Cleveland	James D. Thomas
9:30 a.m.	Research Committee	Detroit	James D. Thomas
9 a.m	Publications Committee	Boston	Dr. Samuel Heiman
9 a.m.	Educational Committee	Washington	Dodd Carr
12 p.m	Branch Librarians and Educational Committee	New York	Dr. W. A. Wesley
4 p.m.	Regional Council Chairmen	Dallas	John P. Nichols
FRIDAY, JULY 29			
9 a.m.	Executive Board	Dallas	Dr. W. A. Wesley

At Milwaukee Branch's "Big Day," April 30. (1) The meeting of the Midwest Regional Council. (2) The Luncheon Session. (3) Lloyd O. Gilbert, principal speaker, in action. (4) Entertainment at the Banquet when "day is done."

Now there's a member of the famous 'LITTLE STEVE' family to handle ALL your plating and processing jobs!



This 'Little Steve' combination Barrel and Basket Machine was designed to bright dip small electrical control components in small batches at a 120-barrel-per-hour rate within rigid space limitations. Parts require top quality finish to close tolerance; 'Little Steve' is only 23 feet long, 6¾ feet wide and normally, 4 feet high. Special built-in dryer shown is an optional feature.

'Little Steve' automatic barrel machines

Now you can precision plate and process small, intricate parts automatically with the new, low-cost 'Little Steve' Barrel Machine. Floor space requirements are kept to a minimum. Fully automatic cycling, as well as automatic loading and unloading features, provides fast, efficient processing of parts to meet your specific requirements. Stevens popular oblique barrels eliminate the need to open and close covers manually.

This completely new addition to the famous 'Little Steve' family of automatic processing equipment is ideally suited to integrated manufacturing methods. Investigate its many benefits today.

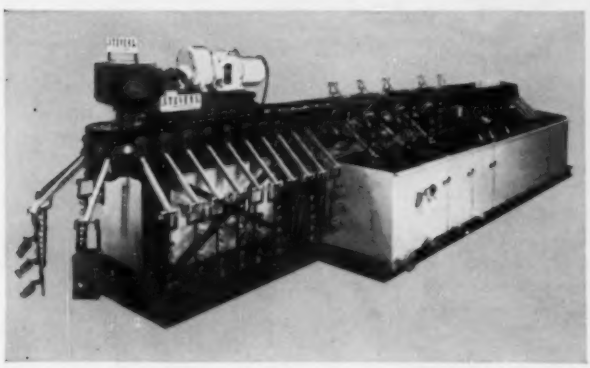
And every 'Little Steve' is designed to give you profitable, high-volume parts finishing capacity in a minimum of space, plus . . .

- . . . low initial investment including installation
- . . . floor-level accessibility without catwalks or ladders
- . . . ready adaptability to new, integrated manufacturing methods
- . . . proven design simplicity and smooth, dependable operation
- . . . exceptional flexibility to meet all your plating and processing requirements

'Little Steve' rack machines

For the economical plating or processing of larger pieces, 'Little Steve' Rack Machines offer BIG performance in the smallest possible area. Originally designed to fill the gap between manually operated tanks and large automatic equipment, 'Little Steve' has permitted many manufacturers to automate their parts processing without a great capital investment.

Completely flexible in design and operation, 'Little Steve' can be easily adapted or relocated to meet your changing processing requirements. See how you, too, can realize greater profits from your parts production. Write for complete information on versatile, low-cost 'Little Steve.'



'Little Steve' with conventional stationary hump cam action offers amazing capacity in relation to its size . . . up to 400 racks per hour on normal plating production. This 'Little Steve' will efficiently handle a wide variety of racks or, if desired, a single part can be placed on each carrier arm.

Also new . . . 'Little Steve' with Vertical Lift, or traveling hump cam action, is the truly compact member of the 'Little Steve' family. Narrower tanks save space, cut solution cost. Recommended for production rates under 100 racks per hour. Note convenient height for servicing or rack removal.

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DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)

Remember — **When you go *automatic* . . . go STEVENS!**

INTERSOCIETY NEWS

NEW ASM METAL AWARDS

Three new ASM Metal Awards have been established by the Trustees of the American Society for Metals.

Two of the new awards will be given in honor of the late William Hunt Eisenman, a founder member of the society and its national secretary for 40 years. The third is in the name of the late Dr. Marcus A. Grossmann, a past president of the metals engineering society.

The William Hunt Eisenman Engineering Award of the American Society for Metals will be presented each year for outstanding contributions in the practical application of the science of metallurgy to the production of metals or their engineering use. This award will be given to that person whose achievements have accomplished significant improvement in metallurgical processing.

The William Hunt Eisenman Teaching Award, for outstanding teachers of metallurgy or related sciences, will be presented to a teacher of long standing reputation through his ability to inspire students and impart enthusiasm and understanding. This is not necessarily an annual award.

The ASM Trustees established The Marcus A. Grossmann Young Authors Award to encourage creative writing by young metal scientists. The award is appropriately named; Dr. Grossmann was a prolific author of metals texts and papers, and was himself a recipient of many of ASM's Metal Awards.

The Young Authors Award will be granted to the authors under age 35 of the most outstanding paper in ASM Transactions, the annual record of scientific developments in the field of metals.

Winners of the Young Authors Award are also eligible for the ASM Howe Medal, given to the author(s) of the best Transactions paper regardless of age. Candidates for the two awards will be judged by the same committee.

ASM's Metal Awards program is designed to recognize and encourage outstanding achievement in every phase of metal industry, science, education and research. Awards are presented each year as a highlight of the ASM National Metal Congress and Exposition, next scheduled for Philadelphia, October 17–21.

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ASTM ANNUAL MEETING STARTS JUNE 26

A look into the present state of knowledge of several facets of materials science will highlight the 63rd annual meeting of the American Society for Testing Materials at Chalfonte-Haddon Hall, Atlantic City, N. J., June 26–July 1, 1960. The society's new Division of Materials Sciences has organized an all-day program for Monday, June 27, consisting of two symposia related to basic materials knowledge: "Symposium on Recent Progress in Materials Sciences" and "Symposium on the Nature and Origin of Strength of Materials."

Dr. W. O. Baker, vice president, research, Bell Telephone Laboratories, will speak Monday noon at the materials sciences luncheon on interdisciplinary laboratories and research and education relating to materials sciences.

Close attention also will be given to solar energy, nuclear fuel element development, low temperature properties of high-strength aircraft and missile materials, acoustical fatigue, and radiation effects and radiation dosimetry.

Other topics less dramatic, but equally important and usually of more direct interest to a larger segment of our economy, also will be the subject of several sessions and symposia: road and paving materials, cement and plaster, concrete, soils for engineering purposes, metals, shear and torsion testing, metallography, high temperature, fatigue, general testing, and quality of observations.

The annual president's luncheon will be held on Tuesday noon, June 28, at which Frank L. LaQue, vice president and manager, Development and Research Division, The International Nickel Co., Inc., will present the annual retiring ASTM President's address. He will discuss the international aspects of ASTM. Awards, introduction of new officers and honorary members, presentation of highlights from the Board of Directors' report, and recognition of 50- and 40-year members will be made at the luncheon.

The Gillett Memorial Lecture, sponsored jointly by ASTM and Battelle Memorial Institute to honor Horace W. Gillett, first director of Battelle, will be presented Tuesday at 5 p.m. by Dr. R. Carson Dalzell assistant to the director, Division of Reactor Development, U. S. Atomic Energy Commission.

On Wednesday evening, the banquet, entertainment, and dance sponsored by the Philadelphia District Council will provide relaxation for a week otherwise filled with intensive technical activity.

An informal panel discussion on low cycle fatigue, sponsored by the Applied Research Panel of the ASTM-ASME Joint Committee on the Effect of Temperature on the Properties of Metals, will be held at 3 p.m., Wednesday.

The Society's technical committees and their subcommittees will hold between 900 and 1000 committee meetings during the week.

The society's biennial exhibit of testing apparatus and laboratory supplies will be held throughout the week, opening Monday noon and closing Friday noon.

♦

LONG PRESIDENT OF ASTME FOR YEAR 1960-1961

H. Dale Long, president and chairman of the board, Scully Jones and Co., Chicago, has been elected president of the American Society of Tool and Manufacturing Engineers.

Mr. Long, a graduate of the University of Illinois, has been with Scully Jones since 1940. He has been active in ASTME since 1943, holding various offices in the Chicago Chapter and the national organization. He was first vice president in 1959-60. Mr. Long will succeed Wayne Ewing, president, Arrowsmith Tool and Die Co., Los Angeles, as president for 1960-61.

In turning over the office to Mr. Long, Mr. Ewing said, "It is with a great deal of pride that I turn over the gavel to H. Dale Long. He has served the Society and industry well over the past years."

"Mr. Long's rise in Scully Jones and his well known business acumen will stand us in good stead. I have known him and worked with him for several years and I admire his knowledge, tenacity and approach. His talents, energy and wisdom will lead the Society to new heights in the year ahead."

♦

KENLY RE-ELECTED PRESIDENT OF AZI

The annual meeting of the board of directors of the American Zinc Institute, its entire slate of officers was re-elected to serve for another year—as president, R. G. Kenly, vice president, The New Jersey Zinc Co., New York City; vice presidents, T. A. Campbell, Anaconda Sales Co., New York City; H. D. Carus, Matthiessen & Hegeler Zinc Co., La Salle, Ill.; E. H. Snyder, Combined Metals Reduction Co., Salt Lake City; treasurer, G. H. LeFevre, U. S. Smelting Refining and Mining Co., New York City; executive vice president and secretary, J. L. Kimberley, New York City.

INDICATE A 642. ➤

To 14 of the 21 leading companies making cars and automotive supplies, Unichrome Coating 218X on the plating racks is a good investment. This plastisol insulation is so tough that damage is a rarity—and long life the rule. It won't chip, crack, tear . . . is highly resistant to abrasion. Racks stay sleek, smooth, tightly sealed in severest plating operations—minimize contamination and drag-out problems.

Because of this extended service life and reduced maintenance, users' costs are minimum. All agree that the best quality saves money in the long run.

Why not follow the leaders' preference for Coating 218X. If you don't apply it yourself, nearby experienced specialists can do it for you. Contact us for details. METAL & THERMIT CORPORATION, General Offices, Rahway, New Jersey.

M&T **coatings and finishes**
METAL & THERMIT CORPORATION

2 OF EVERY 3 LEADERS IN THE AUTOMOTIVE INDUSTRY

...coat plating racks with Unichrome Coating 218X!

photo courtesy: Ford Motor Co.

Directors elected for the term expiring 1963 are T. A. Campbell, Anaconda Sales Co.; A. C. Eide, American Zinc, Lead & Smelting Co.; S. S. Goodwin, The New Jersey Zinc Co.; T. K. Graham, The Anaconda Co.; H. E. Lee, The Bunker Hill Co.; G. W. Potter, Potter-Sims Mines, Inc.; E. A. Torney, The Bunker Hill Co.; H. I. Young, American Zinc, Lead & Smelting Co., and M. M. Zoller, The Eagle-Picher Co.

♦

FIRST NATIONAL DIE CASTING EXPOSITION AND CONGRESS

The First National Die Casting Exposition and Congress will be held in the Detroit Artillery Armory from November 8–11, 1960. Sponsored by the Society of Die Casting Engineers, the Exposition will be the first show in America devoted exclusively to the rapidly expanding die casting field.

The Society of Die Casting Engineers is sponsoring the exposition to permit independent die casters, semi-captive die casting plants and suppliers of die casting machines, die casting dies, metals and alloys, die design services, die steels, furnaces, automation devices, lubricants, coolants, machine controls, pumps, hydraulic equipment, trimming equipment, deburring machines, polishing machines, plating machines and painting machines to display their products and services to a growing market.

In conjunction with the exposition, a technical congress of broad coverage designed to present the latest new developments and trends in the die casting field will be sponsored by the Society.

Subjects planned for discussion in the form of technical papers and panel sessions will include die design, vacuum die casting; anodizable die castings, die steels, buffing, polishing and plating of die castings, zinc, magnesium and brass die casting techniques; lubricants; quality control; handling and treating of metal; machining of dies and die castings; standards; cost control; new markets; large die castings; die casting design; die casting alloys; and die casting equipment and automation.

♦

MANAGER APPOINTED FOR ASM METAL CONGRESSES

Appointment of T. C. DuMond as manager, National and Regional Metal Congresses, American Society for Metals, has been announced.

Mr. DuMond has also been appointed director, membership and chapter relations, confirming a responsibility he has held for a number of months. He will provide liaison, counsel and direction from ASM headquarters to the Society's 31,500 members in 112 chapters throughout the United States and Canada.

MEPA CONDUCTS OUTSTANDING 42ND ANNUAL BANQUET

Conducting one of the outstanding Association banquets of the season for the 42nd year, the Masters' Electro-Plating Association repast held in the Grand Ballroom of New York's famed Plaza Hotel, Saturday, May 14, 1960, filled that banquet hall to capacity. A reception preceded the banquet itself.

The 42nd Annual Banquet was staged by a departmentized Banquet Committee headed by Alfred D'Agostino of the Alfred Plating Works, Inc., Brooklyn, N. Y. Officers of MEPA whose headquarters is located at 59 East 4th Street, New York, N. Y. include Leonard Kornblum, Chairman; Charles Leva, Vice Chairman; Frank Kaiser, Treasurer and Alfred T. Marinaro, Executive Secretary.

At the Banquet, Mr. Marinaro announced the selection of Charles R. Leva, president of Levco Metal Finishers, Inc., Long Island City, as "Plating Man of the Year." Due to death in the family, Mr. Leva was not present to accept the Award. It was announced that the Award would be presented to him at a later meeting of the Association.

Rhodium
ELECTROPLATING
SOLUTIONS

Rhodium, hard and very corrosion-resistant, is an excellent electrical contact material.

Its use is suggested on printed circuits, wave guides, and electrical contacts where light contact pressures, low voltage, and intermittent service are involved.

This Rhodium plating solution is easy to use. It operates over a wide range of temperature and current densities. We will be glad to plate samples without charge.

Backed by 59 Years of Specialization

Consult our staff about plating problems

SIGMUND COHN
MFG. CO., INC.
121 SOUTH COLUMBUS AVE
MOUNT VERNON, N.Y.

For parts like these . . .
barrel-finishing
is best finishing

. . . with TUMBLEX* "S"

Barrel-finishing not only gives parts the best finish — it's the fastest, easiest way to cut your finishing costs-per-piece.

To make sure of this, combine the right barrel-finishing techniques with the right abrasives. And to make sure of the right abrasives choose from the complete Norton line, which covers the entire range of barrel-finishing.

If your metal parts have hard-to-get-at areas — like any of those shown — Norton TUMBLEX "S" abrasives are your best choice. These spheres of bonded ALUNDUM* abrasive roll around and through intricate parts giving high quality and uniformity of surface finish.

Made in 5 sizes, TUMBLEX "S" spheres are made to extremely close diameter tolerances — and they wear down so slowly and evenly they can be used over and over for the same top quality finishing.

Norton TUMBLEX abrasives are all immediately available from stock. Order your selection or send sample unfinished parts to our Sample Processing Department. We'll barrel-finish samples with TUMBLEX "S" or with any other Norton TUMBLEX abrasive, if more suitable. Our report will bring you complete details on how to get the best results. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

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ABRASIVES

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75 years of . . . Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

INDUSTRY NEWS

RAPID ELECTRIC OPENS FOURTH PLANT

Rapid Electric Co. has started production in its fourth plant. Located in Brookfield, Connecticut, at the foot of Graysbridge Road, it provides 30,000 square feet of manufacturing and 4000 square feet administrative and research and development space. This modern plant when operating at full capacity will produce both industrial type and plating power rectifiers. Facilities for research and development have been provided for development of regulated power supplies. Additional transformer, magnetic amplifier and saturable core reactor winding, laminating and assembly is to be performed in the Brookfield plant.

♦

SALES CONFERENCES HELD BY KELITE

Kelite Corp. held its annual Regional Sales Conferences in Los Angeles March 17 to 19 and in Chicago March 24 to 26.

Attending were the executive and technical staff, district sales managers, product managers and all sales engineers. "Single Use Applications of Chemical Cleaners" was the theme of the Conferences. Dr. A. Kenneth Graham, a member of Kelite's board of directors and recipient of the American Electroplaters' Society's 1959 Scientific Achievement Award, spoke on "Application of Fundamentals" (to cleaning before plating).

Dr. Sam Spring, laboratory director, spoke on the "Mechanism of Cleaning by Single Application Aqueous Base Cleaners" and on "Emulsion Cleaning."

Robert Racine, western regional sales manager, and William Sorensen, executive vice president and marketing director, discussed markets and areas of use for various aqueous base cleaners. Charles Chalfant, senior product manager-metal finishing, presented information on steam phosphatizing. Sales engineers and district sales managers presented case histories.

L. C. Sorensen, president, outlined new product developments and presented awards to sales engineers attaining membership in the Key Club, the firm's top sales group.

♦

KIRCHARTZ ANNOUNCES FORMATION OF M-F EQUIPMENT CO.

Formation of M-F Equipment Co. to handle sales of barrel finishing equipment to dealers has been announced by Paul E. Kirchartz, president of Metal Finish, Inc., Newark, N. J.

The new organization will distribute "Vibraslide" vibrating-rotating machines, "Metal Finish" barrel finishing machines, and a complete line of separating and materials handling equipment.

W. H. Armstrong, vice president of Metal Finish, Inc., has been named president of M-F Equipment Co. The new firm will headquarter at 410 Frelinghuysen Ave., Newark, home offices of the parent company.

Mr. Kirchartz is a pioneer in barrel finishing, and was the first to operate a barrel finishing job shop in the East. He established Metal Finish, Inc., in 1952.

P. E. Kirchartz

W. H. Armstrong

Mr. Armstrong has been in barrel finishing many years, associated with Metalcraft Engineering, Inc.; Almco Division of Queen Stove Works, Inc.; and more recently with Minnesota Mining and Manufacturing Co., St. Paul. He joined Metal Finish in 1958.

♦

CARUS OPENS NEW LABORATORY

The Carus Chemical Co., Inc., La Salle, Illinois, sole American producer of potassium permanganate, has opened its new End-Use Research Laboratory to develop and evaluate processes using the company's products in the metal working, metal finishing fields.

Potassium permanganate is being used currently in conjunction with caustic soda to condition heat scale and smut on metal for removal by acid pickling acids, which tend to over-etch and pit base stock.

♦

CHEMRAY AND IDEAL REPRESENT COWLES CHEMICAL

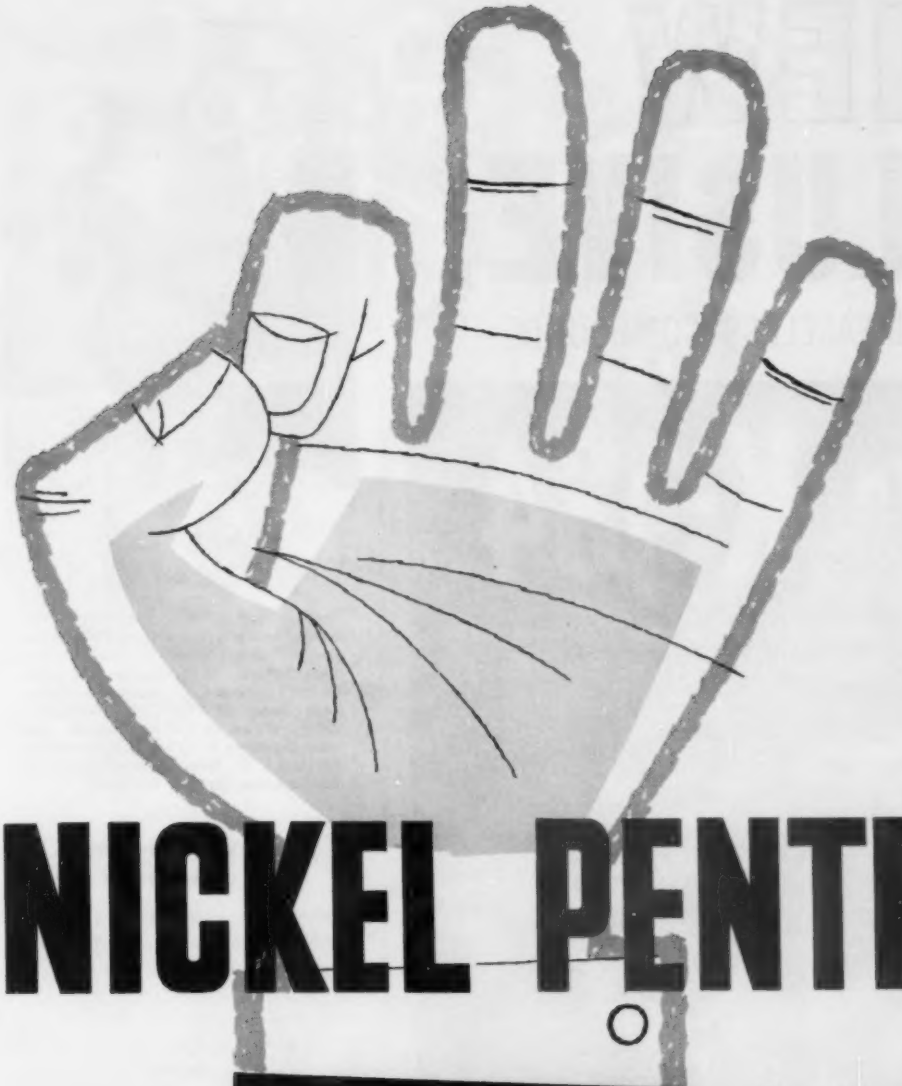
Chemray Corporation, Westchester, Illinois, will serve as dealer for Cowles metal finishing chemicals, providing additional coverage and service for the Chicago area metals trade, until now handled exclusively for Cowles by Allied Research Products, Inc. Allied will continue as a Cowles dealer.

The two dealers are supported with technical assistance by Cowles personnel, George Egger, Midwest Division Manager, Bob Sauter and Ken Deerwester. Raymond F. Ledford is president of Chemray.

Ideal Chemical and Supply Company, Memphis, Tennessee, has been appointed to represent Cowles in Arkansas, western Tennessee and northern Mississippi. Cowles will support Ideal's operation with service assistance by two Cowles technical men, Bill Swift and Bob Sauter.

ALLIED RESEARCH PRODUCTS HEARS EDITORS' PREDICTIONS

Highlight of the Allied Research Products, Inc. national sales meeting held in Baltimore recently, was a panel of editors and publishers who discussed the predicted growth within their respective areas of industry and production in the 1960's. Panelists included (left to right) W. Thomas MacNew, editor *Aircraft and Missiles;* Irwin H. Such, editor, *Steel Magazine;* Hartley W. Barclay, editor and publisher, *Automotive Industries* and Ezra A. Blount, editor, *Products Finishing.* Because Allied's marketing interests are concentrated in metal finishing, each of the speakers laid particular emphasis on finish requirements in his field in the Sixties.



NICKEL PENTRATE®

TOPS the Black Finishing Field

Five points: (1) faster, more uniform blackening, (2) increased corrosion resistance, (3) increased abrasion resistance, (4) improved appearance, and (5) lower operating costs have established Nickel Pentrate as the leader in black oxide finishing. If you are not fully acquainted with Nickel Pentrate and what it can do for your product or your business, send now for free illustrated bulletin which gives detailed information.

HEATBATH CORPORATION
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or 701 North Sangamon St., Chicago 22, Ill.
38 Years of Service to the Heat Treating and Metal Finishing Industry

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 644.

NEW EXCLUSIVE!

ATLANTIC GREASELESS COMPOUNDS

WITH K-134

The miracle additive newly discovered and developed by Atlantic's research laboratories

- REDUCES APPLICATION TIME
- ADHERES BETTER TO BUFFING WHEELS
- CUTS DOWN COSTLY WASTE
- ASSURES UNIFORM SATIN FINISH

Order NEW Atlantic Greaseless Compounds with Additive K-134 for faster, more economical buffing and polishing; and for longer-lasting, higher quality finish of metals, plastics and wood.

Devoted exclusively to producing unexcelled greaseless compounds, Atlantic maintains constant research to continually improve its products. The dependable uniformity of Atlantic compounds is assured by the highest grade ingredients and efficient quality control. Technical assistance and data available on request.

THE ATLANTIC COMPOUND CO.

6 CHARLES ST., CHELSEA 50, MASS.

The University of Wichita library received recently more than 200 books and periodicals for its engineering reference shelves. The donation was made by the Coleman Co., Inc. and included back issues of PLATING MAGAZINE, shown in the foreground. Librian Downing P. O'Hara received the gift from E. G. Johnson, administrator of the Coleman Training Institute.

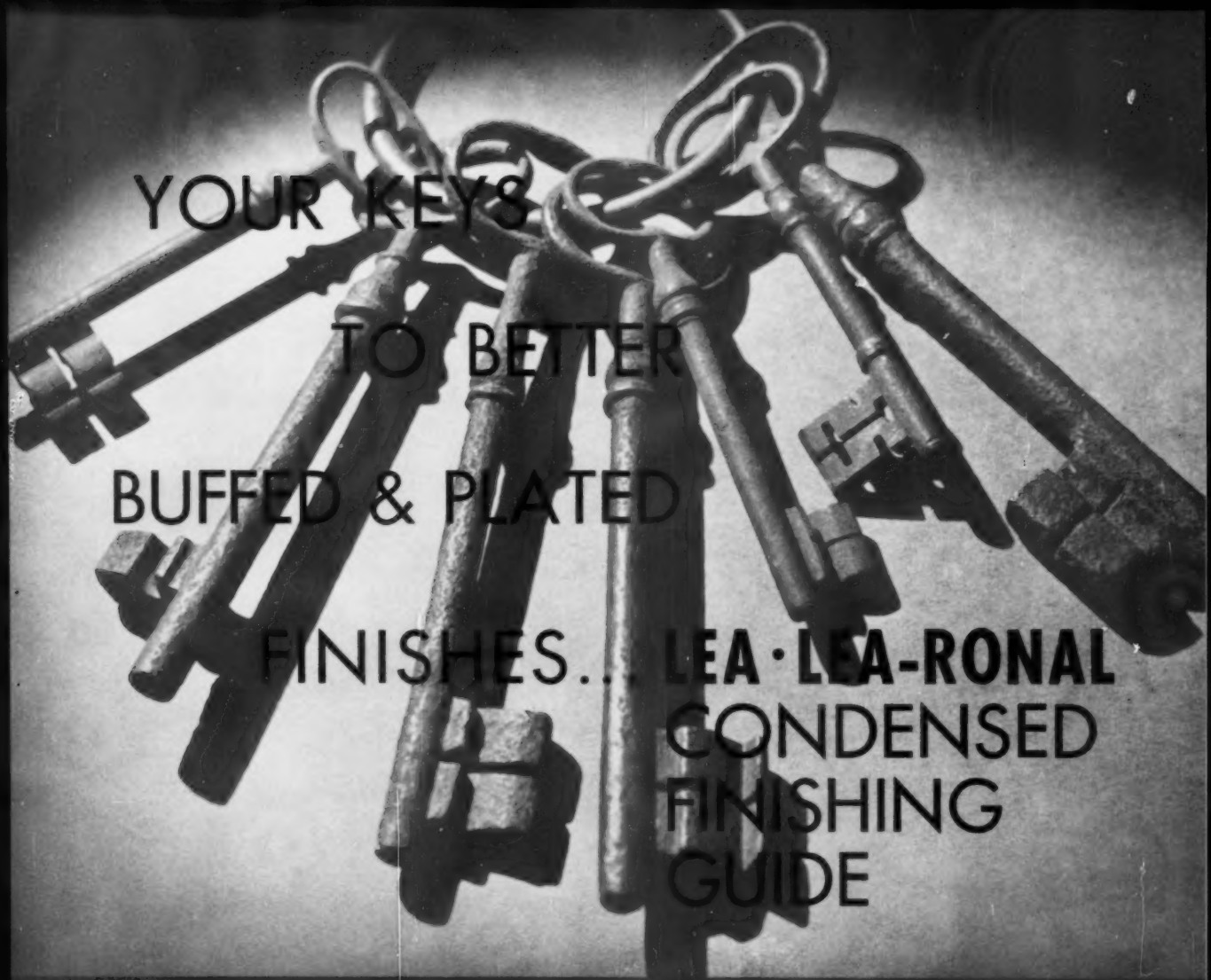
GRAVER EXPANDS IN LATIN AMERICA

Reflecting increased activity in Latin America and the Caribbean area, Graver Water Conditioning Co., New York, has announced the appointment of six new sales representatives for those regions. Three of the new representatives will carry Graver's complete line of water treatment and chemical processing equipment; two will handle Graver clarifiers, and one will offer all three types of equipment.

The new representatives for water and chemical treatment equipment include: Navarro y MacMurray, S.A., Calle 26 Este No. 5-33, Panama City, Panama; A. T. Schiller y Cia., Yerbal 341, Buenos Aires, Argentina; Mastermax, Ltd., 44 Barry Street, Kingston, Jamaica, B.W.I. Representatives for clarifiers include: Cuba Tecnica Industrial, S.A., 431 La Metropolitan Building, Havana, and J. M. Santiago, 3930 Durango Street, Coral Gables, Florida, for Honduras. Representaciones Asociadas, Ltda., with main offices at Carrera la, No. 11-7, Cali, Colombia, has been named for water treatment equipment, chemical processing systems and sugar clarifiers. This firm has branch offices in Barranquilla, Bogota and Medellin.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 645.

INDICATE A 670. ➤



LEA · LEA-RONAL CONDENSED FINISHING GUIDE

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PRODUCTS
METHODS
TECHNICAL SERVICE

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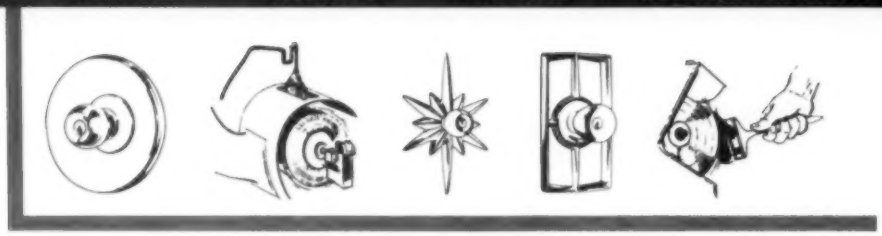
LEA MFG. COMPANY OF ENGLAND LTD.
Buxton, Derbyshire, England

COMPLETE TESTING AND MANUFACTURING FACILITIES TO HELP YOU SOLVE YOUR PRODUCTION LINE PROBLEMS IN

BUFFING • POLISHING • BURRING • LAPPING • SATIN FINISHING



SATIN FINISHING — BURRING — POLISHING COMPOUNDS

LEA COMPOUND — industry's pioneering greaseless abrasive compositions for burring, buffing, satin finishing, and flexible polishing; contains abrasives ranging from sharp, fast-cutting grits to fine, soft powders for delicate finishes.

LEA PLASTI-BRADE — flexible, fast-drying, liquid abrasive, burring, polishing and satin finishing compositions, available in a wide range of abrasive grit sizes.

LEABRAMENT — greaseless, non-flammable, quick-drying, liquid abrasive for burring and polishing; can be sprayed or brushed on wheels.

BRIGHT BUFFING COMPOSITIONS

LEAROK — fine abrasive compositions with "no free grease" designed primarily for buffing or coloring pieces which involve cleaning difficulties; does not pack up in recesses and ornamentations.

LEA LIQUABRADE — clean-working, fast-cutting and mirror-finishing liquid buffing compounds, providing in effect continuous operations and substantial economies in compositions and buffs; clean and safe, non-flammable, non-explosive; many abrasive types and grain sizes for all non-ferrous metals, steel, stainless alloys, and plastics.

LEA LAPPING PASTE — micron size controlled abrasive paste for accurate and fine surface finishing.

ADHESIVES and CEMENTS

AD-LEA-SIVE — glue-base adhesive for sizing buffing and polishing wheels to improve application of Lea Compound, or loose abrasives; available in bar form.

LEA PLASTI-GLUE — fast-drying, flexible liquid adhesive, without abrasives, for preparing polishing wheels and abrasive belts.

LEA GRIPMASTER — high bonding strength cement for polishing wheels and belts; used in setting up longer lasting polishing wheels and belts for both ferrous and non-ferrous metals.

POLISHING WHEEL and BELT LUBRICANTS

LEA LIQUALUBE — water soluble liquid lubricant for polishing wheels and belts; can be sprayed or brushed on.

LEA LUBAR — bar form lubricant for polishing wheels and belts where glazing is not a problem.

cLEAn GRAIN LUBAR — special bar form lubricant to eliminate glazing on polishing wheels and belts.

BRIGHT PLATING PROCESSES and ADDITIVES

LEA COPPER-GLO — (with LEA-RONAL Bright Copper Process)

COMPANION PROCESSES:

Q-STRIKE
Q-LEVEL
CUPRALL

See Lea-Ronal ad for details of these processes.

PLATING ROOM ACCESSORIES

LEA ANALYTICAL METHODS — plater's short cut methods for analyzing plating solutions.

LEA LECTROMAG — portable electrical instrument for measuring the thickness of non-magnetic coatings on carbon steel and iron.

LEA KROMSAVERS — mist preventive for chrome and other plating solutions.

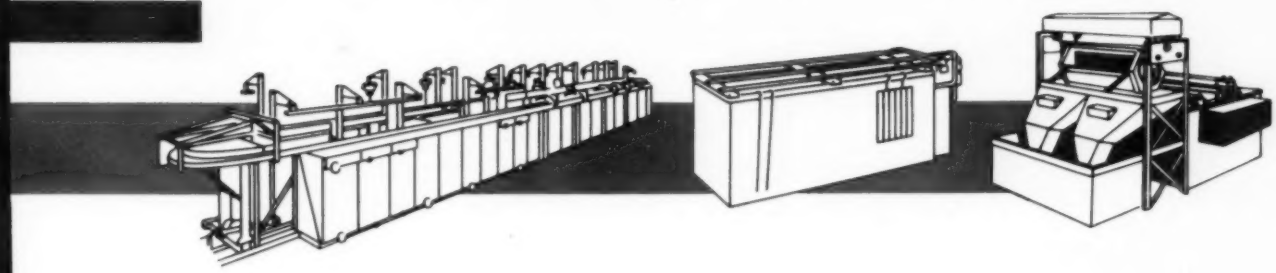
LEATARDENT — anti-stain dip emulsion; prevents staining and tarnishing of plated surfaces.

LACQUER ROOM SPECIALTIES

LEA COLDSTRIP — a room temperature stripper for enamels and lacquers.

LEA SYNSTRIP — high speed stripper for synthetic enamels; leaves non-ferrous surfaces smooth; no etching; especially effective in stripping epoxy resin coatings.

TESTED BRIGHT PLATING PROCESSES, ADDITIVES AND SPECIALTIES DEVELOPED BY ELECTROCHEMISTS TO EXACTING STANDARDS. PRODUCT AND PROCESS HAND IN HAND FROM ONE SOURCE OF SUPPLY.



LEA-RONAL COPPER PLATING PROCESSES and COPPER ADDITION AGENTS – CYANIDE COPPER PROCESSES

COPPER-GLO – Bright Copper – a proven brilliant high speed bath exceptionally tolerant to impurities.

CUPRALL – produces high speed buffable copper where brilliance is not required.

Q-LEVEL – a high speed lustrous copper process; produces excellent "hiding" characteristics. An ideal undercoat for bright nickel.

AIR Q-LEVEL – Q-Level process designed specifically for operation with air agitation.

PRQ-LEVEL – Q-Level process designed for operation with periodic reverse current.

Q-STRIKE – A cyanide copper strike that produces a superior foundation for subsequent copper and nickel deposits.

CYANIDE COPPER ADDITION AGENTS – for use with any type cyanide copper.

CW-7 WETTING AGENT – a wetting agent with high degree of stability. Increases tolerance of bath to organic contamination; benefits anode corrosion.

SUPERTARTRAL – exceptionally effective addition agent for cyanide copper baths; aids anode corrosion, reduces cyanide breakdown.

LR-1 – chrome reducer. Particularly effective in copper strikes and plating baths where chromium contamination is high.

TST – a purifier for all copper baths and strikes contaminated with zinc and chromium.

ACID COPPER PROCESSES

CUPROTYPE – smooth, tree-free heavy deposits at high speed. Proven for electronic use (printed circuitry etc.), electrotyping, electroforming, etc.

COPPER-GLEAM – brilliant deposits with exceptional leveling characteristics.

LEA-RONAL NICKEL PROCESSES

NICKEL-GLEAM N-222 – ductile deposits, with exceptional leveling characteristics, high throwing and covering power. Same solution operates with air or mechanical agitation.

NICKEL-GLEAM N-1 – bright all purpose type of bath, exceptional tolerance to impurities, very active nickel surface. A true workhorse nickel bath.

NIKAL PC – a controlled stress nickel for printed circuitry and allied electronic industry uses.

NICKEL-GLO "C" – a bright cold barrel addition agent simple to operate.

NICKEL-GLO "BA" – a hot bright high speed barrel process. Produces heavy ductile bright deposits.

LEA-RONAL GOLD PLATING PROCESSES

AURO GLO 4 – an acid type bright ductile, easily controlled gold process; designed for electronic and allied uses. Hard, porosity free bright deposits.

AURO GLO 12 – a modification of Auro Glo 4 where hardness of 350-400 Knoop is desired. Produces Hamilton colored shade, ideal for jewelry and allied uses.

AURO GLO HS – a *neutral*, zero free cyanide, bright high speed process. Rates of deposition of 0.003" per hour readily obtained from a low concentration bath.

AURO GLEAM 24.00 – an entirely different acid type bath producing 100% *pure bright* gold deposits – no alloying elements.

LEA-RONAL BRASS PROCESSES

BRASS-GLO – uniform lustrous deposits over a wide current density range. High speed lustrous deposits with ease of control – for still tank operation.

BRASS-GLEAM – a lustrous high speed hot barrel type solution. Produces uniform color over wide range.

LEA-RONAL BRIGHT SILVER

SILVER-GLO – produces bright, hard tarnish-resistant deposits at high rates of speed from crystal clear solution. For industrial or decorative uses.

LEA-RONAL BRIGHT ZINC

– a bright zinc for barrel and still operation. Stable brighteners have long staying power.

LEA-RONAL BRIGHT CADMIUM

– a bright protective cadmium electrodeposit for use on both ferrous and non-ferrous metals.

WATERSHED

– liquid rinse aid which promotes free rinsing and fast drying, hence reduces staining and spotting of plated pieces.

CHROMESHED

– a powdered water soluble material which reduces and ties up hexavalent chromium in rinse tanks and cleaners.

PRODUCT WDL-1

– a water displacing liquid which offers a simple economical means of drying plated work.

LEA and LEA-RONAL for

BURRING • BUFFING • LAPPING • POLISHING • PLATING

SATIN FINISHING • STRIPPING • ANALYZING

INDUSTRY'S SHOPPING CENTER

for PLATING and SURFACE FINISHING PRODUCTS and TECHNICAL SERVICE

Our laboratories in Jamaica, New York, Waterbury, Connecticut, and Detroit, Michigan, and our field engineers are always ON CALL. Lea is FINISHING HEADQUARTERS for literally hundreds of manufacturers . . . we would like to tackle your Plating or Finishing Problems. Write or call . . . we're ready to help you cut your costs and get a better finish.

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Main Office and Laboratory:
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INDUSTRY NEWS BRIEFS

CONVERSION CHEMICAL LICENSES SILVERCROWN LTD.

Conversion Chemical Corp. has announced the licensing of Silvercrown Limited, London, England, for the manufacture of the complete line of Kenvert specialty items in England, the British Commonwealth (excluding Canada), and the outer seven of the European common market.

This agreement is another step in the expanding operations of Conversion Chemical, a relatively new company formed only five years ago. Nicromatic Limited, Toronto, Canada, is licensed to manufacture and sell Kenvert products in Canada and these products are available through distributors in major industrial cities in the United States.

Keaneth Bellinger, president of Conversion Chemical, attended a metal finishing conference the latter part of April at Scarborough, when announcement of the licensing was made to metal finishing personnel in England.

♦

CONGRESS ON METALLIC CORROSION TO BE HELD IN LONDON

The First International Congress on Metallic Corrosion to be held under the auspices of the International Union of Pure and Applied Chemistry will take place in London on the April 10 to 15, 1961. A Scientific Committee has been set up, under the Chairmanship of L. Kenworthy (the present chairman of the Corrosion Group of the Society of Chemical Industry), to organize scientific sessions of the Congress. It is intended to devote much of the Congress to discussion of papers dealing with original work, but first class up-to-date review papers will also be included.

♦

U.S. STEEL HAS THINNER TIN PLATE

Details of a new "lighter, thinner" tin plate recently disclosed by United States Steel Board Chairman Roger M. Blough have been revealed.

Developed by U. S. Steel at its Research Center and plants, the process permits production of tin plate about half the thickness of anything now used in can making.

U. S. Steel is seeking patent protection on the new method.

U. S. Steel's new tin plate is a completely different product. The new process produces tin plate in weights ranging from 40 to 60 pounds per base box. Most tin plate now used is in the 75 to 100-pound base box weight range.

♦

AMERICAN ZINC INSTITUTE IN NEW QUARTERS

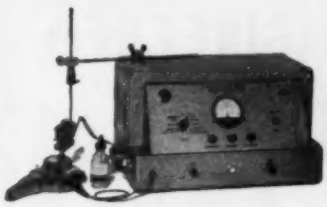
As of Tuesday, May 3, American Zinc Institute, Inc. has occupied new and larger offices at 292 Madison Avenue, New York 17, N. Y. The new AZI phone number will be ORegon 9-6020. The entire 14th floor is to be occupied by the institute, full administrative staff of AZI's expanded research program, and the Lead Industries Association. American Zinc Institute, Inc., a non-profit organization, is the national trade association of the zinc industry.

♦

IBM SIGNS CONTRACT WITH CHEMICAL MILLING INTERNATIONAL

The Electric Typewriter Division of International Business Machines Corp., New York, has entered into a contract with Chemical Milling International Corp., El Segundo, Calif., for research and development work on the application of chemical milling techniques to the mass production of components. The work will be undertaken at CMI's El Segundo plant.

Thickness Testing . . . Analysis and pH made simple with KOCOUR EQUIPMENT



- direct reading
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- 90–95% accurate
- simple operation

Test composite coatings . . .
. . . CHROMIUM-NICKEL-COPPER
Individual thickness readings!

No need to use approximations or lengthy chemical methods to determine composite coating thickness. Model 955 determines the thickness of each layer with separate readings of actual thickness for each coating. This is one of the many applications of the Kocour Electronic Thickness Tester. Operation is simple and automatic . . . 90–95% accurate . . . direct readings. Write for Bulletin 400.

Control your plating solutions regularly with KOCOUR TEST SETS

Regular control is not only convenient, but you save time . . . avoid delays and shut down, and prevent trouble. KOCOUR TEST SETS provide the best and most direct methods of control. They are complete . . . simple to use . . . no knowledge of chemistry required . . . calculations are minimized.

Whatever your needs . . . KOCOUR TEST SETS are available individually or in economical combinations for the control of plating, cleaning, pickling, anodizing, sealing, coating, passivating, desmutting, deburring, phosphorizing, heat treating, pH control and thickness testing. Write for your FREE copy of "Lab Hints for the Plater".

● KOCOUR are specialists and pioneers in testing equipment for controlling plating — cleaning — pickling — anodizing — and hardening processes . . . special sets can be provided for your requirements.
Write today for further information—no cost or obligation.

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CHICAGO 32, ILLINOIS

Specify KOCOUR test sets from your supplier.

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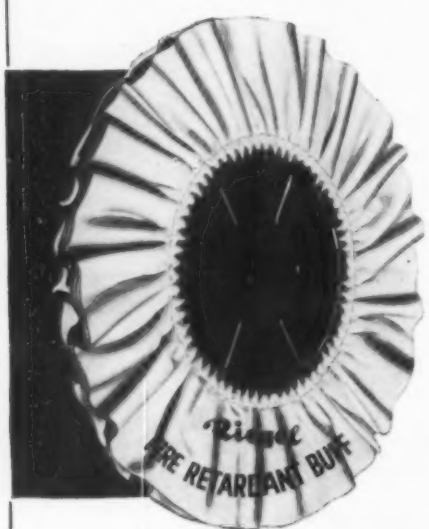
A Complete Line–
Cloth Polishing Wheels



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PATENT ABSTRACTS

DR. D. GARDNER FOULKE
SEL-REX CORPORATION
Nutley, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,898,273, 8/4/59—DISC-LOADED WAVE GUIDES—L. LaForge, et al assignor to Stanford University, California.

An electroforming method is claimed for making disc-loaded wave guides.

3 claims.

No. 2,893,274, 8/4/59—ELECTROPLATING ZINC-TIN ALLOYS—E. Saubestre and A. Arnaut, assignors to Sylvania Electric Products, Inc. Delaware.

The solution contains zinc, tin, a cyanide source and a hydroxide source, the cyanide ion being present in an amount less than that required to complex all the zinc and the total amount of cyanide and hydroxide being sufficient to complex all the zinc.

22 claims.

No. 2,898,275, 8/4/59—PRODUCTION OF TITANIUM—E. Andrews, assignor to New Jersey Zinc Co., New York.

A method for the production of titanium by electrolysis of a fused halide solution is claimed.

See also No. 2,898,276 with 2 claims.

4 claims, figure.

No. 2,898,283, 8/5/94—UNLOADING DEVICE—L. Howard, assignor to Metal and Thermit Corp., N. Y.

A barrel plating device especially applicable to chromium plating is described which has a removable work receiving tray.

5 claims.

No. 2,898,285, 8/4/59—PLATING RACK—R. Henson, assignor to General Motors Corporation, Detroit, Michigan.

A rack having a robber bar adjacent the work piece, said bar insulated with rack coating and a layer of conducting material (metal powder and binder) over the organic coating. Conducting means is provided to the outer coating.

4 claims, figure.

No. 2,899,289, 8/11/59—LIME BUFFING COMPOUNDS—L. High, assignor to The Udylite Corp., Detroit, Mich.

A buffing composition is described as 70 to 80 per cent lime, 10 to 20 per cent long chain saturated fatty acid, about 1 to 6 per cent petrolatum, about 2 to 5 per cent tallow and about 0.1 to 5 per cent of at least one tertiary amine containing at least five carbon atoms.

See also No. 2,899,290 assigned by W. Riegler and J. Dybalski to Armour describing a mixture N-tallow-trimethylene diamine and N-bis (2 hydroxyethyl)—soya amine as a lime compound anti-slake additive in 6 claims.

11 claims.

No. 2,899,332, 8/11/59—CHROMIZING—G. Samuel, assignor to Metal Diffusions, Inc., Philadelphia, Pa.

Ferrous parts are placed in a retort with chromium and a dry complex made by reacting ammonium bifluoride with chromium. The retort is heated to 1650 to 2300F.

3 claims, figure.

No. 2,899,333, 8/11/59—SILVERING MIRRORS—R. Gee and J. Gibbs, assignors to Saftee Glass Co., Philadelphia, Pa.

Activate the surface with titanous chloride then deposit a metallic reflectant material on the surface.

5 claims.

No. 2,899,367, 8/11/59—PREPARING SURFACES FOR PLATING—L. Veeder, assignor to North American Aviation, Inc.

To prepare a metal surface for plating from a non-aqueous bath, clean in aqueous cleaner, then apply an organic composition of 5–95 per cent of organic acids (9–36 carbons) or organic ethers (8-22 carbons) and 95–5 per cent of a ketone (3–4 carbons), then plate in the non-aqueous bath.

10 claims.

No. 2,899,368, 8/11/59—SEALING ANODIC COATING—R. Spooner, assignor to Aluminium Laboratories, Ltd., Montreal, Canada.

Sodium and potassium molybdate and ammonium paramolybdate are described as additives to an anodized aluminum sealing bath. The *p*H should be 5.8 to 6.0 and the temperature above 90C.

5 claims.

No. 2,899,369, 8/11/59—ELECTROLYTIC PROCESSING—H. Slatin, assignor to Timax Associates, New York, N. Y.

A process for the production of columbium and tantallum from a molten bath is described.

14 claims.

2,899,777, 8/18/59—APPARATUS FOR MECHANICALLY FINISHING WORK PIECES—L. Davidson, Sturges, Michigan.

A machine, method and compound for mechanically polishing a work piece wherein the pieces are driven downwardly into the compound.

29 claims.

2,900,274—8/18/59—COATING GLASS FILAMENTS WITH SILVER—H. Whitehurst, assignor to Owens-Corning Fiberglas Corp., Delaware.

A strand of glass is passed through silver nitrate and hydrazine sulfate to deposit a silver film.

4 claims.

2,900,313—8/18/59—IMPROVING PLATING SPEEDS—E. Saubestre and E. Bulen, assignors to Sylvania Electric Products Inc., Wilmington, Del.

The use of ammonium molybdate (1 to 3 oz/gallon) and gelatin (1 to 2 oz/gallon) in plating baths containing cyanide and hydroxide.

See also 2,900,314 by E. Saubestre describing this combination as an addition agent for a zinc-tin plating solution (10 claims).

1 claim.

2,900,707—8/25/59—METALLIC PROTECTIVE COATING—H. Brown, assignor to The Udylite Research Corporation, Detroit, Michigan.

A metallic bright protective coating is described as consisting of bright nickel (0.5–2 mil) followed by a nickel alloy (0.05–1 mil). The alloy is described as an alloy of nickel with at least one metal selected from cobalt and iron.

4 claims.

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2,901,334, 8/25/59—REMOVAL OF IRON FROM ALUMINUM—M. Brown, assignor to Aluminum Company of America, Pittsburgh, Pa.

Aluminum surfaces carrying iron impurities are cleaned with an aqueous solution consisting of at least 0.05 per cent by weight of soluble citrate and at least 0.005 per cent by weight of soluble sulfite ion. The *p*H is given as about 7.0.

See also 2,901,344 describing cleaning aluminum with a citrate-nitrate solution (3 claims).

3 claims.

2,901,385, 8/25/59—BONDING COAT FOR METAL, Leo Curtin, Cranbury, New Jersey.

An adherent microcrystalline chromite-phosphate bonding coat is formed on ferrous surfaces by immersing the parts in a solution containing a dichromate (Ba, Ca, Mg and Zn) and a reducing agent which is less than equivalent to the dichromate along with phosphoric acid and zinc dihydrogen phosphate then heating the parts to above 100C to substantially completely reduce any chromate in the film adhering to the part.

8 claims.

2,901,408, 8/18/59—COATING METHOD—Raymond Townsend, assignor to USA (AEC).

A method of protectively coating beryllium metal consists of etching in an acid bath, then in a sodium zincate bath, followed by an immersion in concentrated nitric acid after which a second zincate dip treatment is made and then the object is plated in a copper bath. Finally a layer of chromium is plated on the copper.

1 claim.

2,901,409, 8/25/59—ANODIZING MAGNESIUM—H. DeLong, assignor to The Dow Chemical Co., Midland, Michigan.

The anodizing bath is an aqueous solution of water-soluble inorganic compounds consisting of the radicals: ammonium, fluoride, phosphate, sodium and hexavalent chromium. The *p*H is given as 0.5 to 4.0.

9 claims.

2,901,410, 8/25/59—REFINING TITANIUM—R. Dean and W. Gullett, assignors to Chicago Development Corp., Riverdale, Md.

An electrolytic method (molten bath) for preparing pure titanium is claimed.

See also 2,901,411 also assigned to Chicago Development Corp. (1 claim).

1 claim.

2,901,412, 8/25/59—ANODIZING ALUMINUM—N. Mostovych and A. Cybriwsky, assignors to Reynolds Metals Co., Richmond, Va.

The single claim reads: "An anodizing apparatus comprising: a first unit including a first shunt-resistor rectifier and a first tank for containing an electrolyte for anodizing an aluminum surface immersed in said electrolyte, said tank having cathode and anode terminals; a second unit substantially similar to said first unit, said second unit including a second shunt-resistor rectifier and a second anodizing tank having cathode and anode terminals; an alternating current source having first and second power terminals and a common terminal; means electrically connecting both anode terminals to said common terminal; and means electrically connecting said first power terminal serially through the first rectifier to the cathode terminal of the first tank and said second power terminal serially through the second rectifier to the cathode terminal of the second tank, each rectifier constituting a means for restricting the inverse current flowing through it to a value substantially less than that of the anodizing current flowing therethrough.

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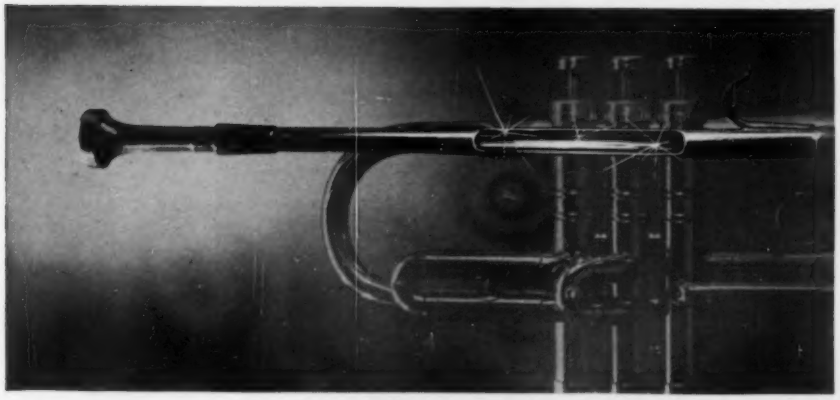
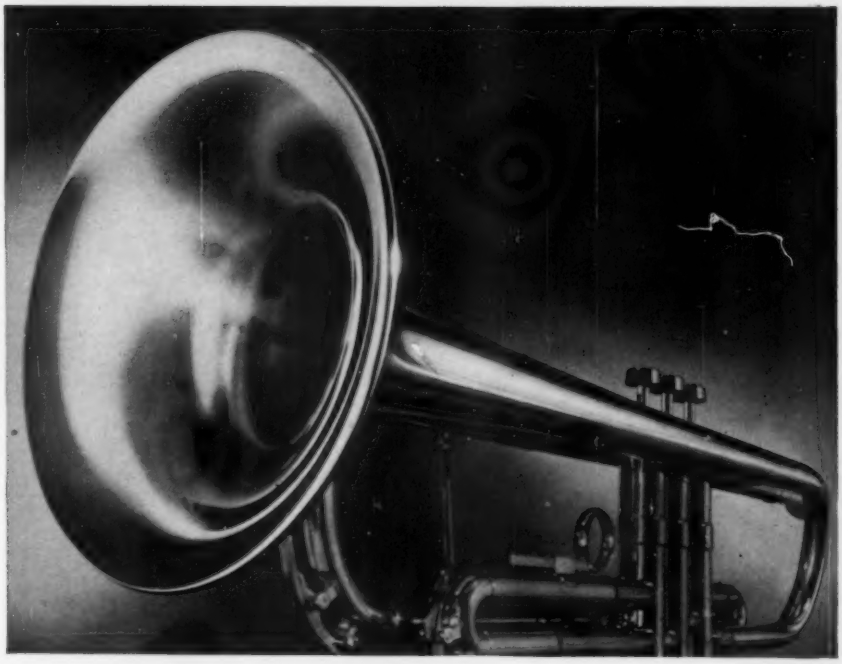


CONN ELECTRO-D TONE CHAMBER (mouthpipe) cut away to illustrate the "micro finish" interior surface. Chamber and mouthpiece receptacle are formed in one piece by electrodeposition; previously the two pieces were soldered together. (Patent pending.)



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Made by The American Brass Company

2,901,433, 8/25/59—CLEANING COMPOSITION—S. Spring, assignor to Pennsalt Chemicals Corporation, Philadelphia, Pa.

The composition consists of 1–50 per cent of a soap (alkali metal, ammonium, amine, alkynolamine) of fatty and rosin acids, 5–80 per cent water, 1–50 per cent of an organic acid (rosin and fatty acids with 6 to 26 carbons), 6–90 per cent of an organic solvent (hydrocarbon solvents boiling between 75 and 400C, CCl_4, per- and tri-chloroethylene) and at least 0.05 per cent of a neutral alkali metal salt (sulfate, chloride or chromate).

12 claims.

2,904,413, 9/15/59—BRIGHT DIPPING ZINC BASE ALLOYS—Kenneth Hempel, assignor to Jervis Corp., Grandville, Michigan.

A bright finish for zinc alloys is obtained by short immersion in a solution containing:

Chromic acid	6.5–20 per cent
Nitric acid	2.7–15 per cent
Hydrofluoric acid	1.0– 8 per cent
Water	To make 100 per cent

6 claims.

2,904,414, 9/15/59—CADMIUM AND ZINC BRIGHT DIP—C. Ostrander and N. Congiundi, assignors to Allied Research Products, Inc., Baltimore, Maryland.

Claim 1 reads: "A composition for use in aqueous solution to impart a protective, bright coating to zinc and cadmium articles comprising at least one chromic compound selected from the group consisting of chromic acid and water soluble salts thereof, at least one sulfate compound selected from the group consisting of sulfuric acid and water soluble salts thereof, at least one boric compound selected from the group consisting of boric acid and water soluble salts thereof and nitric acid and in which said chromic compound is in amount equivalent to from about 20 to 160 grams of chromic acid per liter of solution, said sulfate compound is in amount equivalent to an amount, in grams of sodium sulfate per liter of solution, of sodium sulfate having a ratio by weight of 1:6.5 to said equivalent chromic acid range, said boric compound is in amount equivalent to from about 10 to 40 grams of boric acid per liter of solution and the nitric acid is in amount to give a *p*H of not greater than about 1.0, when the said composition is put in aqueous solution."

2,904,419, 9/15/59—BUFFING COMPOUND—E. Couch and Ellsworth Candee, assignors to The Lea Mfg. Co., Waterbury, Connecticut.

A polyethylene casing as a buffing compound package is claimed.

4 claims, figure.

2,904,456, 9/15/59—METALLIZING CERAMICS—H. Nolte assignor to General Electric Co., New York.

A mixture of metal powders (essentially molybdenum trioxide and manganese) in a volatile liquid vehicle is applied to the ceramic and heated in a reducing atmosphere at 1200 to 1400C.

4 claims, figure.

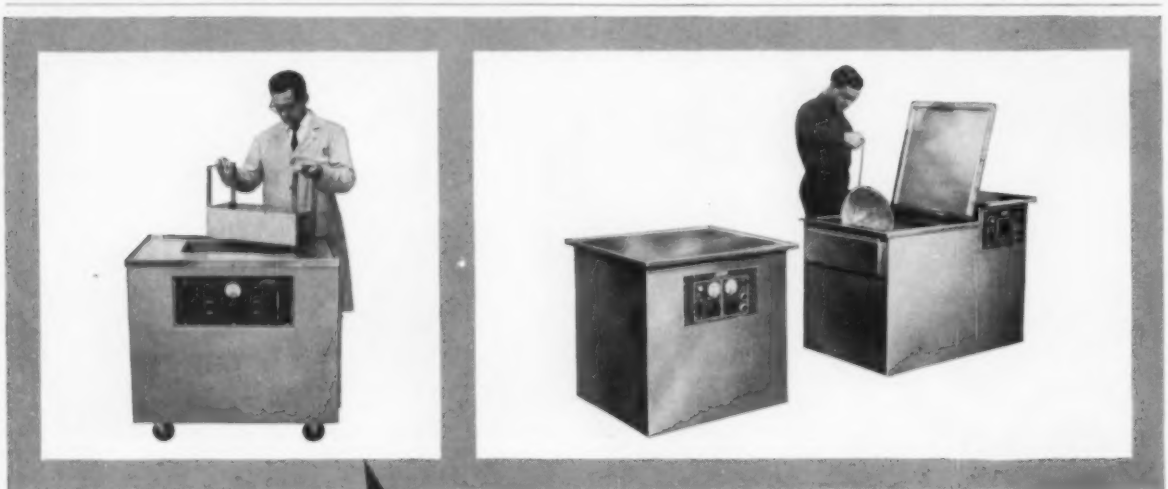
2,904,479, 9/15/59—ELECTROLYTIC POLISHING—A. McCord and D. Spink, assignors to the Carborundum Co., Niagara Falls, N. Y.

Zirconium and hafnium, it is claimed, can be electropolished in a concentrated solution of ammonium fluoride.

7 claims, figure.

2,905,573, 9/22/59—GAS PLATING—P. Marvin, assignor to Union Carbide Corp., New York, N. Y.

The deposition of nickel from nickel carbonyl on a combustible



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B-2	1000	9 to 15

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support, followed by burning off the support to give a metal article the shape of said support, is described.

7 claims, figure.

2,905,599, 9/22/59—DEPOSITING ZIRCONIUM ON URANIUM, J. Wick, assignor to U.S.A. (AEC).

A method of depositing zirconium on uranium by means of a molten salt bath is claimed.

4 claims.

2,905,600, 9/22/59—ANODIZING—J. Franklin, assignor to Sanford Process Co., Inc., Los Angeles, California.

A method is described for anodizing aluminum wherein the article is anodized at 40 to 65F followed by anodizing at 0–40F.

17 claims.

2,905,601, 9/22/59—BRIGHT GOLD—E. C. Rinker and R. Duva, assignors to Sel-Rex Corporation, Nutley, N. J.

An electrolyte for producing bright gold deposits is described as containing 10 to 150 g/l of a weak, stable organic acid partially neutralized with alkali to provide a *p*H of 3–5, 1 to 15 g/l of gold added as a gold cyanide and 1–50 g/l of at least one soluble base metal salt.

18 claims.

2,905,602, 9/22/59—METAL ELECTRODEPOSITS—A. Kirstahler et al., assignors to Dehydag, Dusseldorf, Germany.

The addition of quaternary ammonium compounds to bright electroplating baths which are adversely affected by hard water additions is claimed. Baths mentioned include copper, zinc, nickel, chromium and precious metals.

7 claims.

2,905,603, 9/22/59—ZINC PLATING—W. Safranek and H. Miller, assignors to American Zinc Institute, New York, N. Y.

Bright deposits from an acid zinc electrolyte are claimed to result when 0.5 to 7 g/l of ammoniated glycyrrhizin is added to the bath under periodic reversal of current conditions.

5 claims.

2,905,614, 9/22/59—FIXTURE FOR PHONOGRAPH RECORDS—L. Porrata and E. Porterfield, assignors to Columbia Broadcasting System, Inc., New York, N. Y.

An electroplating fixture for holding phonograph record masters and stampers for plating is described.

11 claims.

2,906,002, 9/29/59—SELENIUM RECTIFIER PLATES—H. Nagorsen and H. Schweickert, assignors to Siemens-Schuckertwerke, A. G., Berlin, Germany.

A rectifier consisting of a base electrode, a layer of selenium, a cover electrode of a cadmium alloy, and a blocking layer is claimed.

3 claims, figure.

2,906,641, 9/29/59—ALUMINUM COATED STRIP—W. Bugbee and P. Clough, assignors to National Research Corp., Cambridge, Massachusetts.

A process for producing aluminized black iron by vacuum deposition of aluminum is described. The rate claimed is in excess of 0.01 g/sq ft/sec.

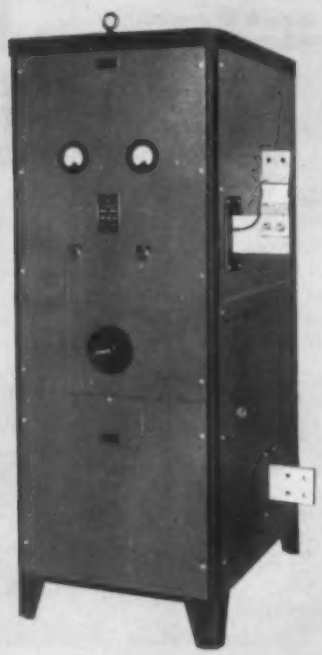
1 claim, figure.

2,906,677, 9/29/59—TREATMENT OF TINPLATE—E. Smith and J. Smith, assignors to National Steel Corp., Delaware.

The yellow discoloration resistance of tinplate can be improved by anodically treating in an aqueous chromate-free electrolyte (acidic) followed by cathodically treating in a similar bath. The chromate-free bath contains phosphates and nitrates.

15 claims.

(*Continued on page 747*)



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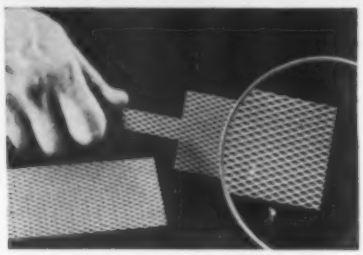

E—601. PLATINUM MESH ANODE—A new platinum-ized titanium-mesh anode, said to be equal functionally to solid platinum, but costing less than one-tenth as much, has been developed by Sel-Rex Corp. Trade-named Platanium Anodes, the new product is manufactured from titanium-mesh, coated with a uniform thickness of platinum metal, electrolytically bonded by the Sel-Rex Platanex Process. The titanium-mesh is of a diamond configuration design which, it is stated, affords maximum anode area while cutting down over-all size 50 per cent or more.

E—602. CADMIUM PLATING PROCESS—Hanson-Van Winkle-Munning Co. has announced the availability of an advanced process for bright cadmium plating. Trade name of the process is Cadalume L.

Cadalume L brightener may be added directly to the bath. No break-in period is required; the desired results with respect to deposit brightness are immediately evident in a balanced bath. The brightener concentration is not critical; there is no decrease in the brightness of deposits with a moderate variation from the norm in brightener content.

The process is claimed to be characterized by the following: (1) Increased plating speeds, (2) Improved deposit distribution and throwing power, (3) Heavier deposits without loss of brilliance or tendency to form nodules or trees, (4) Stable brighteners with no salting-out effect, (5) No tendency to induce pitted deposits, (6) Wide bright range.

E—603. ALUMINUM ETCHANT, SMUT REMOVER AND CLEANER—The Mitchell-Bradford Chemical Co. announces three new metal-finishing products for the treatment of aluminum—namely Aluminum Etch no. 22, Al-Smut remover and Cleaner no. 20 (non-etch aluminum cleaner).

No. 22 is a free-flowing salt mixture. It is said to clean and produce either a fine or deep etch, depending upon the concentrations, time and temperatures used.

Al-Smut Remover is a chemical salt mixture which, when mixed with water in the recommended proportions, is claimed to remove smut from most types of aluminum, which is formed in some cases, during etching or cleaning operations.

Cleaner No. 20 is a non-etching aluminum cleaner formulated with a maximum of active and inactive sodium oxide content for aluminum cleaning adequately buffered to insure high activity and long life. It will rinse easily and thoroughly from work being cleaned and can be used at concentrations of 6–8 oz/gal of water, and operated at 160–190F.

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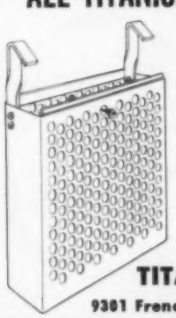

3" x 12" x 12" $55.00
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10 p.m. to 2 a.m.—Thursday, July 28
Marshall McGraw and his Music

THE UDYLITE CORPORATION
Detroit, Michigan

THE L. H. BUTCHER COMPANY
Udylite on the west coast

E—604. SEMI-BRIGHT NICKEL PROCESS—Permalume, an air-agitated sulfur-free semi-bright nickel process claimed to be both ductile and high leveling, is now available from Hanson-Van Winkle-Munning Co. Permalume is said to offer a high degree of corrosion protection to users of dual or duplex nickel coatings. In addition to its use as an undercoating in a duplex system, it is an ideal deposit to buff or satin-finish.

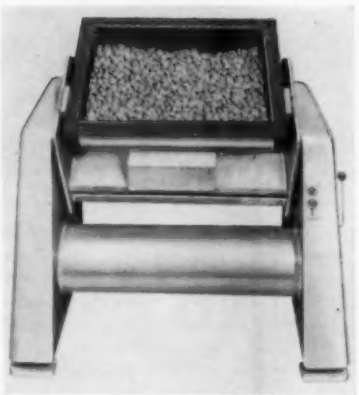
The process contains one consumable leveler and stable ductilizer adaptable to all operations and is characterized by: The bath may be carbon treated continuously, no harmful reduction or hydrolysis products are formed, control of all constituents is simple, throwing power of the bath is said to be excellent, and exceptionally high speed operation is possible because air agitation is employed.

E—605. VACUUM OPTICAL COATER—The vacuum coater introduced by Vacuum Specialties Co. departs radically from the conventional base-plate bell-jar design. The unit breaks at the middle.

The cylindrical section of the bottom allows a large area for assorted power, cooling or other feedthrough seals for a complicated sequence of coating operations.

The flat end plate, top and bottom, provide reference planes for setting up internal work, drive motors or other equipment for rotating and otherwise moving the parts to be coated.

E—606. VIBRATING TUMBLER—The Stevenson Co. announces the development and marketing of a new piece of equipment, the "Stevadoer", that can be utilized as a vibrator for mixing, pulverizing, deburring, descaling, cleaning and screening, grading stones, or for surface refinement of any metal parts.

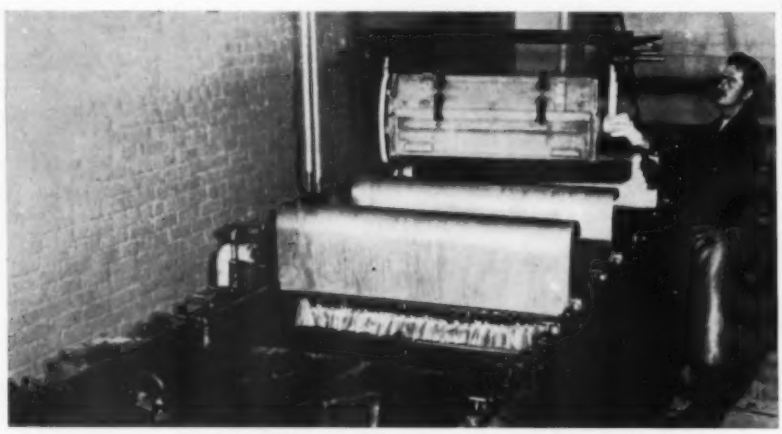


This novel design concept is claimed to enable maximum tumbling with minimum movement and current consumption. One hundred per cent of the media is vibrated in the tub, with negligible vibration transmitted to the base itself, thus requiring no bolting down of the equipment, and it can readily be moved from place to place. The suspension system permits angular positioning of the tub, while maintaining vibration of the media and parts in any position. In the inverted position it serves to screen the materials. Provisions are made for obtaining various degrees of flow of parts and for varying the amplitude of vibration.

E—607. VINYL DISPERSION RESIN—Further broadening its line of polyvinyl chloride resins, Diamond Alkali Co. has announced the development and availability of PVC 70, a new vinyl dispersion resin for organosols and plastisols.

PVC 70 is said to allow the formulation of dispersion compounds with several distinct advantages over conventional compounds: low viscosity at both low and high shear rates as well as excellent viscosity stability. Factual technical bulletins giving physical properties as well as sample quantities are available.

E—608. OVERLOAD TRIP—"Instatrip", a new overload tripping device for plating rectifiers is being offered by Dresser Electric Co. It is mounted directly on any size 50 milivolt shunt and interlocked with the magnetic starter or other remote operated disconnect. When dc loads reach or exceed a factory preset percentage of the shunt rating, "Instatrip" instantaneously takes equipment off the line.



Barrett Sulfamate Nickel at Industrial Electroplaters, Inc., Binghamton, N.Y.

Superior **THROWING POWER**

Now — with Barrett Sulfamate Nickel for barrel plating you can reach those hard to plate areas — produce an evener deposit — obtain more protection.

In addition, Barrett Sulfamate Nickel for barrel plating offers these other advantages:

Stress-free deposits • Uniform hardness • Unequaled ductility • High temperature protection • Low sensitivity to impurities • Excellent grain structure • Less porosity

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THREE MONTHS BETWEEN
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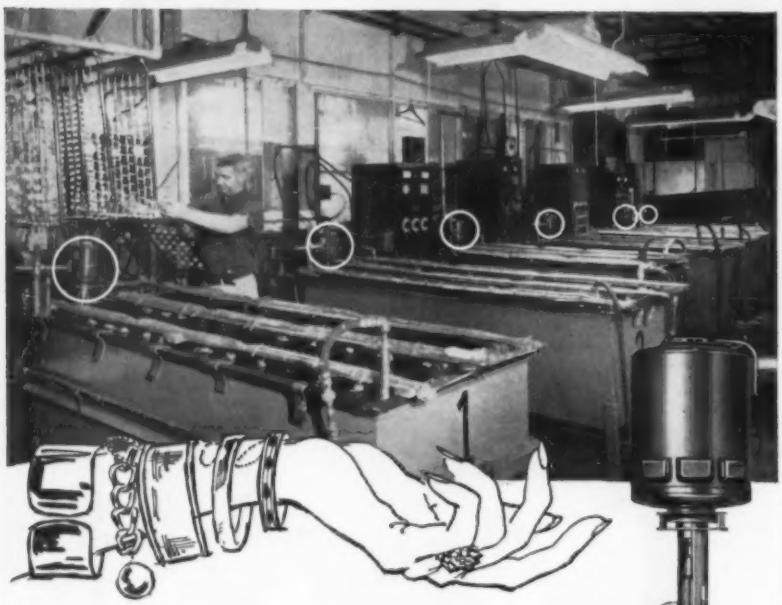

bergère, inc., of Providence, manufacturers of fine costume jewelry, purchased six WINSCOTT FILTERS for use in their bright nickel plating operation. John Henry, head plater for bergère, had this to say about the filter:

"We used to break down our nickel tanks once a month for treatment and sludge removal. Since we've been using the new Winscott Filters in each tank for continuous filtration, we can run three months between carbon treatments. Even with this long interval, there is never any sludge in the tanks."

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The new
WINSCOTT
FILTER

for Consistent, Faster, Higher Quality Plating with Low Maintenance and Operating Costs.

Check these features of the NEW WINSCOTT FILTER and you'll see how it can do a *better* job in your shop.

- Keeps Surface Clean Constantly Regardless of Solution Level
- No Solution Loss Due to Leaks . . . Most Important in Precious Metal Solutions
- Solution Agitation Built into Filter
- Entire Filtering Unit Submerged in Tank, Cannot Aerate Solution
- Requires Small Space in Tank . . . No Equipment in Aisles
- Large Filter Area at Low Cost . . . Easy to Clean
- Corrosion Resistant Construction Throughout

Check these features again and write for further information and name of your nearest distributor.

The Chemical Corporation
57 Waltham Avenue • Springfield 9, Massachusetts

E—609. POWER PACK—A new portable Dalic power pack with sharply stepped-up current capacity is announced by Sifco Metachemical, Inc.

The new unit operates on 220 volts, single phase, 60 cycles; has output of 0–50 amp at 0–30 volts with stepless voltage control and special amp/hr meter having 0.01 amp/hr divisions.

The new power pack is 32 by 24 by 18 inches. Weight, complete with all leads, is 227 lb.

The Dalic process is a method of depositing any one of a large variety of metals—from antimony to zinc—on as many different types of base metal. No tank immersion is required, and selected areas of the work may be plated without extensive masking or stopping off.

E—610. CHELATING CLEANER—Cleaner 808, an alkaline electrocleaner for steel which contains chelating agents, has been introduced by Enthone, Inc. The chelating action of this cleaner is said to make it possible to remove smut, light rust, oxides and light welding scale from steel parts in addition to soil and fingerprints. The cleaner is designed for heavy-duty anodic cleaning of heavily soiled steel which has enough smut, rust or oxides on it to defy complete cleaning in a conventional steel electrocleaner.

Cleaner 808 is a dustless, free-flowing, powdered product which is dissolved in water at concentrations of 8–10 oz/gal. A current density range of 50 to 75 amp/sq ft at temperatures of 180 to 210F is recommended.

The chelating agents present impart water softening ability and make the cleaning solution effective in hard water areas. The surfactants present produce a low, controlled foam blanket on the surface of the solution which minimizes spray and hydrogen gas explosions.

E—611. PAINT DEFLOCCULATOR—A new paint deflocculator called KeFloc, has been developed by Kelite Corp.

It is used to treat the wash water in paint spray booths to cause the paint overspray to be held on the surface of the wash water for deactivation, collection, and easy removal. It is said to deactivate the new paints including the epoxys, acrylics, and acid wash primers, in addition to most other paints. Silicones are not used in foam control, eliminating the possibility of interference with the organic finish.

E—612. DRUM FAUCET—A cast aluminum, self closing, lockable, gasket type, drum faucet which will not leak with any chlorinated solvent except methylene chloride and chloroform has been developed by Foster Aluminum Alloy Products Corp. The internal spring being stainless steel will not rust and clog up the

faucet. It is less costly than ground seat units and obviously much faster to use than screw cocks. It also is claimed to outlast die cast zinc faucets. The faucet is equipped with a red handle to identify its specific use for chlorinated solvents only, since the gasket material is soluble in water. The company will make recommendations for any other fluids or compounds by testing a customers sample.

E—613. CURRENT/VOLTAGE REGULATOR—Matthew Laboratories introduces its Model CVS-300 bantam size constant current and constant voltage regulated power supply designed for the powering of solid state equipment on the bench or in the rack. The CVS-300, which is transistor and zener diode regulated, measures only 4.75 in. wide by 4.5 in. high by 6.25 in. deep. On constant current operation the unit provides up to 400 ma at a maximum of 30 v. On constant voltage operation the CVS-300 provides up to 500 ma at from 4 to 36 v. A front panel switch sets the unit at either constant current or constant voltage regulation operation, as desired.

E—614. ULTRASONIC UNIT—Blackstone Corp. offers a new compact ultrasonic system for laboratory applications and precision cleaning requirements. The Model SG-2 consists of the ultrasonic tank and generator as one compact unit. Built-in timer permits selection of desired operating cycle or "hold" position for continuous operation. It is especially designed for smaller volume cleaning applications and laboratory evaluations.

E—615. ALUMINUM POLISH—A polish called Met-All is claimed to provide a practical solution to problems of aluminum discoloration, pitting and corrosion has been introduced by the Anton Co.

In addition to cleaning and polishing aluminum to a mirror-like finish, Met-All polish also cleans and provides a protective finish on other metals including copper, brass, silver and gold, pewter, nickel, chrome, and stainless steel.

There is no abrasive in Met-All polish, so it is said to be safe to use on finest finishes. It is available in large quantities for industrial use.

FOR LASTING BRIGHTNESS

on both copper and brass without noxious fuming.

FOR ALUMINUM

where the surface hardness of anodizing is not required.

FOR DIE CASTINGS

uniform, low-cost finish ideal for later painting.

BRIGHT AND RIGHT for any job

Luster-on®

the Economical Chromate Conversion Coatings

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rivaling chrome for many applications where cost is a factor . . . long-lasting easily controlled applications.

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on economical zinc . . . scintillating golds, yellows, blues, greens, violets, reds, brass and copper hues.

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most attractive appearance where corrosion protection, humidity, handling are involved during processing . . . at extremely low cost.

Luster-On proved process guarantees excellent operating control

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Now-28 ISOBRITE PLATING BRIGHTENERS

For Zinc, Cadmium, Copper and White Brass
HAVE THE *FOUR* BIG FEATURES YOU ASKED FOR!

When the Allied line of brighteners, now known as ISOBRITE, had the famous ARP trademark on them, we made a survey to find out exactly what *you* wanted most in brighteners. Your answers helped guide our research and development staff in evaluating and consolidating our new line.

Now, here are the results—the industry's most complete line—28 *ISOBRITE Brighteners with these most-wanted features:*

1. LONGER LIFE

Your own records will show ISOBRITE Brighteners give longest possible life in rack or barrel plating operations.

2. BRIGHTNESS

You'll see for yourself that ISOBRITE Brighteners give a diamond-like sparkle that just can't be matched.

3. THROWING POWER

Even if your product has deep recesses, you'll get a uniform, all-over brightness that only ISOBRITE Brighteners can give you.

4. WIDER BRIGHT RANGE

ISOBRITE Brighteners operate efficiently over exceptionally wide current density ranges and have greater tolerance for temperature change.

Remember, there's an ISOBRITE Brightener especially designed for your specific operations—whether you're rack or barrel plating zinc, cadmium, copper or white brass . . . an ISOBRITE Brightener that is entirely compatible with most other brighteners. Don't just order brighteners—specify ISOBRITE. There *is* a difference!

Your Allied Finishing Systems Engineer will be glad to discuss the benefits of ISOBRITE Brighteners in your operations. He's listed in your 'phone book under "Plating Supplies." Or, write for technical data and product list giving details of your operations.

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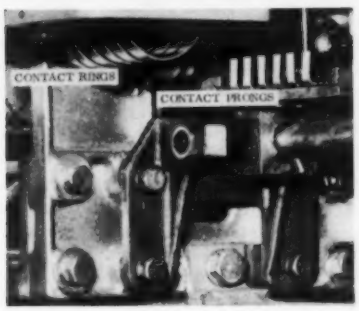
Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

E—617. DISPATCH KEY AUTOMATED PROCESS—An Abbey-Matic rack system is claimed to have unprecedented flexibility in automated multi-process cycle selection and variation, directed and controlled by its new printed circuit key-card dispatching. Another new development by Abbey Process Automation, Inc., it constitutes a major breakthrough in overcoming the complexities of multi-processing with full automation. Abbey-Matic first to advance beyond the synchronized and fixed sequence stages of conventional "automatics" with its patented "leap-frogging" carriers and station



"by-passing" principles, now multiplies its automated cycle selection possibilities. Innumerable process variations can be automatically cycled in a single system without manual assists. Cleaning and other metal preparative processes can be integrated with plating and finishing in a single system and piloted by one operator. The new printed circuit dispatch keys function as carrier guides and controls, utilizing their various printed electrical circuit combinations for directing and activating the movements of the carriers throughout the system.

E—618. ORGANIC COATINGS STRIPPER—Esbec Speedi-Strip No. 1010 is an effective stripper for removing epoxies, acrylics, alkyds and baked enamels from aluminum, copper and brass as well as steel and stainless steel. As it is the bond releasing type, it is economical and does not deteriorate and the only additions required are because of drag-out.

Once the bond is broken, the coating flushes off cleanly under a water spray.

E—619. LATHE—A new lathe, incorporating the advantages of top performance lathes, but stripped of all unnecessary "frills" to keep costs to a minimum, is now being produced by Murray-Way Corp.

The simplified design eliminates excess cast iron and expensive inside-base adjustments. Lathe capacity is from 10 to 20 hp. The spindle is driven by multi-V-belt sheaves which may easily be replaced by removal of a sheet metal guard. Speeds may be varied by changing the motor sheaves.

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Line for Metal Finishing

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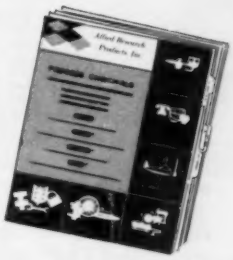
A complete line including IRIDITE Chromate Conversion Coatings for non-ferrous metals, IRILAC Clear Protective Coatings for all metals, ISOBRITE Chemically Different Plating Brighteners and ARP Process Chemicals.

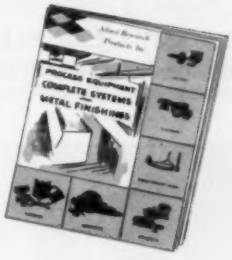
If one of our present products does not meet your needs, we'll be glad to work with you to find an answer to your problem.



EQUIPMENT AND COMPLETE FINISHING SYSTEMS

Includes information on WAGNER Silicon and Selenium Rectifiers, WAGNER Auto-Loaders for transfer of racks and parts from conveyors to plating machines or between conveyors, Automatic and Semi-Automatic Plating Machines, Barrels, Tanks and other equipment.

Also includes information on Process Engineering Service—complete plant design, specification and installation.



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Price and delivery information on a wide variety of plating room necessities, including ROLL-TOP Zinc anodes, FLAT-TOP copper anodes, ELECTROCOP Flat Copper anodes, Cadmium and Tin Anodes, Acid Replacements, Buffs, Chemicals, Cleaners and Maintenance Materials.

NICKEL RECASTING SERVICE

Ask about our Subscription Plan which combines your new nickel purchases with a service to recast your butts and spears, resulting in substantial savings.

WRITE DIRECT . . . **for your copies of these FREE DATA FILES, or contact your Allied Field Engineer. He's listed in the yellow pages under "Plating Supplies".**

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IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

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E—620. ALKALINE CLEANER—The Mitchell-Bradford Chemical Co. announces a new type alkaline, soak cleaner known as Cleaner No. 14.

It is said to incorporate into its formulation, a new approach to emulsification and the latest developments in dispersants, penetrants, wetting and detergency. It is also formulated to accomplish heavy duty soak cleaning—not only prior to applying decorative finishes, but also for removal of quenching oils, greases, etc., during heat treating operations.

E—621. RECIPROCATING AGITATOR—The Dayton Rogers Manufacturing Co., Minneapolis 7, has recently developed a new pneumatic reciprocating agitator.

This equipment was primarily designed for the basket agitating, cleaning, degreasing and dipping of loose parts as placed in a given basket. It is a small portable lightweight unit needing only to be connected to the average shop airline to obtain the driving power.

Loads up to 150 lb can be agitated at any desired stroke from 1 to 6 in., and agitating speeds vary, on both up and downstroke, from one to twelve strokes per second.

E—622. DEBURRING MACHINE—A new high production Acme double end deburring machine that automatically chamfers the ID, OD and face of tubular steel parts of various diameters and lengths is now available from Acme Manufacturing Co. Tubing from ¾- to 2¼-in. diameter and from 2½- to 24-in. long can be deburred by this machine at production rates up to 6000 pieces per hour. Fixtures are designed to permit rapid tool change from one tube diameter to another. No fixture changes are required for tube length variations within a given tube diameter. The machine is completely mechanically operated to simplify operations and insure reliability.

E—623. MASKANT—A new maskant or masking solution for the protection of nonmilled surfaces is available for use in stainless steel chemical milling. It is said to resist etchant attack for 8 hours at 140F and may be either dipped or sprayed to form a tough, pliable, rubber-like film thickness of 10 to 12 mils.

This Maskant S51K808 was developed by Rinshed-Mason Co.

PRIOR ISSUES OF TECHNICAL PROCEEDINGS AVAILABLE FOR YOUR ORDER

ASIDE from the fast dwindling supply of copies of the AES's world acclaimed GOLDEN JUBILEE EDITION of its book TECHNICAL PROCEEDINGS (1959 Edition), the Society has a limited quantity of the 1958 Edition of that book also available for sale.

Copies of the 1958 Edition are priced at $12.00 per copy domestic, $15.00 per copy foreign. Orders are processed on strictly a "first come-first served" basis. Payment in full must accompany each order.

In addition, the AES has a very limited supply remaining, with steady demand, of the 1957 Edition of its TECHNICAL PROCEEDINGS. These are priced at $10.00 per copy domestic, $12.50 per copy foreign. Payment in full must be received with each order.

In ordering, please make checks payable to American Electroplaters' Society, Inc. Mail orders to:

AMERICAN ELECTROPLATERS' SOCIETY, INC.
American Building, 443-445 Broad Street, Newark 2, N. J.

M1

Will produce 1000 gallons or more of pure water between regenerations. Flow rate: 5 gallons per minute.

C5

Will supply 500 gallons or more of pure water per cycle. Flow rate: 2½ gallons per minute.

Min-ex

Small portable de-mineralizer is ideal for laboratories and precious metal plating.

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It Costs You .3¢ Per Gallon With A CARMA DE-MINERALIZER

If you are paying more than 3/10ths of a cent per gallon for distilled water, it will pay you to check with us for a De-Mineralizer that is *right* for you.

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Carma De-Mineralizers assure low investment and operating costs while removing all ionizable impurities, including C_2O and silica.

Ideal For

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- Purer rinse water (no water marks)
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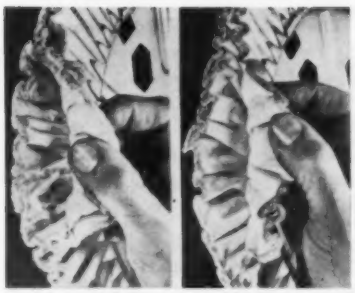

E—624. BINDERIZED BUFFS—Hanson-Van Winkle-Munning Co. has announced the availability of a new binderizing process—the means by which the buffing wheel cloth is impregnated with the same binder used in buffing compounds. The buff is provided with an internal lubricant that permeates every fibre of the cloth, so that the last inch wears as well as the first. Six major advantages of the H-VW-M Binderized Ruff-L-Buff have been demonstrated in actual production line operations: (1) longer buff life, (2) better compound adherence, (3) faster cutting action, (4) extended compound life, (5) heading-up time, (6) cooler running.

E—625. ULTRASONIC CLEANING BASKET—The Circo Ultrasonic Corp. announces the development of a solid, stainless steel Circosonic basket with barium titanate transducers sealed in the bottom. Connected to the Circosonic generator, Model PG125, the Model CB125 basket can be submerged in virtually all solutions for use as an ultrasonic cleaner.

The basket has an operating frequency of 40kc and can use either the regular 180° barium titanate transducers or the high temperature 300° barium titanate transducers. It may be used in the warm liquid rinse of a standard liquid-liquid vapor degreaser; in hot or cold solution tanks; or in the pre-cleaning tanks of a plating system.

New Schaffner bias
BUFFS
give more mileage...
Because
...FULLY VENTILATED
...COOLER RUNNING
LOW COMPOUND CONSUMPTION
...FEWER SECTIONS NEEDED
...GIVES LONGER LIFE
...LATHE FACED AND BALANCED
MADE BY THE MANUFACTURERS OF FAMOUS AND ACCEPTED SCHAFFNER NO NUBBIN BUFFING COMPOSITIONS
"Schaffner Bros. make things shine"
Bob — Paul — Gus
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MANUFACTURING COMPANY, INC.
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• ALL-PURPOSE BUFFING COMPOUNDS • WHITE COLORING COMPOUNDS • NICKEL BUFFING (LIME) • EMERY CAKE • PLASTIC BUFFING COMPOUNDS • TALLOW GREASE STICK
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COMPOUNDS MADE IN BAR, SPRAY OR PASTE

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MANHATTAN RUBBER LINING PROTECTS COSTLY PICKLING AND PLATING EQUIPMENT ...*Permanently*

STOP CORROSION
STOP CONTAMINATION

- THICK, MULTIPLE CALENDERED SHEETS
- INSEPARABLE RUBBER-TO-METAL BONDS
- ELIMINATE DANGEROUS "STRAY CURRENTS"
- NATURAL OR SYNTHETIC RUBBER
- WON'T HARDEN, CRACK OR OXIDIZE
- TESTED UNDER HIGH VOLTAGE

Be *certain* of lifetime protection for your costly equipment and protection against contamination of expensive plating baths. Specify Manhattan lining on your next tank lining job.

Photo courtesy Hanson-Van Winkle-Munning Co.

MANY MANHATTAN LINED TANKS HAVE BEEN IN CONTINUOUS USE OVER 30 YEARS!

ENGINEERED RUBBER PRODUCTS ...MORE USE PER DOLLAR

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RAYBESTOS-MANHATTAN, INC.

MANHATTAN RUBBER DIVISION • PASSAIC, NEW JERSEY

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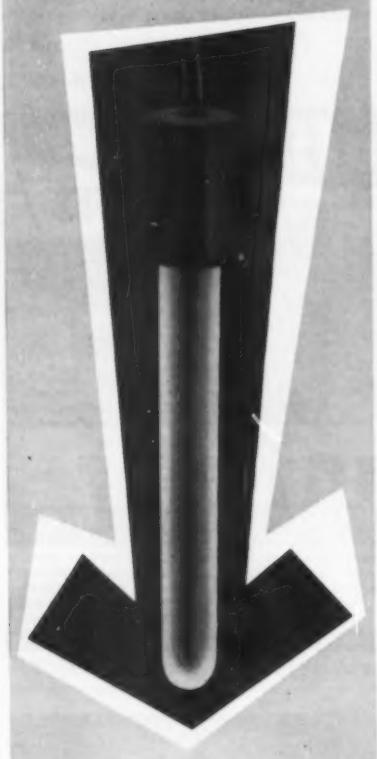
VITREOSIL®
ELECTRIC IMMERSION HEATERS



VITREOSIL heaters are **fused pure silica** . . . ideal for heating acid pickling and electro-plating solutions and other acid baths. VITREOSIL Electric Immersion Heaters can be used with phosphoric acid **at temperatures up to 200°C** and with certain cyanide baths under controlled conditions. Besides immunity to extreme chemical, electrical, and thermal conditions . . . besides offering exceptional characteristics, VITREOSIL heaters feature:

- **Increased heat transfer per unit area**
- **Greater resistance to chemical attack**
- **Molded rubber cap for efficient sealing and simple installation**
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DEAR SIR:

In the March 1960 issue of PLATING there appeared an article by Warren G. Lee on the age hardening of nickel coatings prepared by chemical deposition. This hardening process in nickel-phosphorus deposits is one of tremendous metallurgical interest, for it seems to be a remarkably unusual example of precipitation hardening. Current theories of the mechanism of precipitation are based upon cohesion between the precipitate and the lattice of a solid-solution matrix. Inasmuch as X-Ray data seem to indicate that there is no crystalline matrix of the as-deposited metal, the accepted theory cannot be applied directly to account for the tremendous increase in hardness which occurs on heat treatment of chemical nickel coatings. The question which arises is a simple one—is the coherency theory of precipitation hardening inadequate or is the hardening which occurs in chemical nickel caused by a process utterly different than that involved in precipitation hardening?

Obviously, experimental data are required to answer the question which I have just posed. In the case of Mr. Lee's paper, one cannot help but wonder about the significance of one of the curves in Figure 2. His data for 500F are remarkable in that the maximum hardness is intermediate between the hardness values obtained at 450F and those at 600 or 550F. Although the author recognized that this curve appears to be abnormal he does not indicate clearly whether replicate determinations always gave the same results. It would be helpful to future investigations if the reliability of the data could be exactly evaluated.

There are two other points which my students and I have questioned. In the fifth paragraph of his paper, Lee refers to the work of Westbrook on the hardness of intermetallic compounds as a function of temperature. We are much puzzled by the inclusion of this reference, for Westbrook did not study precipitation hardening in the first place, and secondly, his hardness measurements were made at various temperatures, whereas Lee was concerned with room-temperature hardness after heat treatment at various temperatures. We can find no reason whatever for reference to Westbrook's work and feel that the author should make clear what he has in mind.

We are puzzled also by the first sentence of the last paragraph wherein the author says the maximum hardness in chemical nickel deposits can be attained at temperatures lower than 400C. The maximum hardness referred to in his text is 925 VHN or 1000 VHN, depending on whether one reads the text or looks at the table or Figure 2. On the other hand, in the fifth paragraph the author reports that VHN hardness as high as 1195 has been reported by Goldenstein et. al. It would seem obvious, therefore, that it has not been demonstrated that maximum hardness can be obtained at temperatures lower than 400C.

Finally, we are curious about the transformation at 400C referred to in the last paragraph of Lee's paper. No transformation at this temperature appears in the equilibrium diagram for the nickel-phosphorus system, although admittedly the system has not been thoroughly investigated. If Lee has knowledge of a transformation not previously described, particularly at the significant temperature of 400C, it would be an important contribution which would help tremendously in elucidating the mechanism of precipitation hardening in chemical nickel deposits, and we urge him to publish it at the earliest opportunity.

HAROLD J. READ
Professor of Physical Metallurgy

The Pennsylvania State University
College of Mineral Industries
Department of Metallurgy
University Park, Pennsylvania

DEAR SIR:

I am in receipt of [the] recent letter concerning the comments by Dr. Read and his students at Pennsylvania State University concerning my paper "Age Hardening of Chemical Nickel Coatings". I am quite pleased at the attention my article appears to be receiving and happy to reply to the questions which have been raised.

1. The significance of the hardness versus temperature data for the 500F isotherm is admittedly questionable, as I pointed out in my article. At the time this article was written, no replicate experiments had been run to ascertain the accuracy of these results. However, we are in the process of repeating this experiment. We hope to have this information in the near future and will be happy to make it available.

2. The reference to the Westbrook work was not meant to infer that his investigation was concerned with precipitation hardening. Admittedly, he evaluated hot hardness, whereas we made our measurements at room temperature. The point to this reference is that electroless nickel coating hardness after heat treatment at 400, 500, 600, 700 and 800C can be correlated linearly with temperature. At each of these temperatures, the transformation to the assumed intermetallic compound Ni_3P is practically instantaneous.[1] It has also been shown by photomicrographs that, as the heat treatment temperature is increased from 400 to 800C, with the time being held constant, crystal size and agglomeration increase.

3. The apparent discrepancies in maximum hardness referred to by Dr. Read have several explanations. It has been shown that the maximum hardness *for a particular isotherm* is related to the phosphorus content of the coating.[2] The hardness maximum increases directly with the phosphorus content.[3] Since it is known that for a constant bath composition, the amount of phosphorus in the "as deposited" coating increases inversely with the initial bath *p*H,[4] small variations in phosphorus content can occur, which also may explain variation in the maximum hardness values.

Finally, as you probably well know, it is impossible to determine an absolute value of hardness on thin plated specimens. There is always an uncertainty inherent in the measurement which is both mechanical and subjective. Therefore, hardness values in this work, and in others, must be taken as a statistical mean with an uncertainty as high as ±25–50 DPN units.

4. Nickel-phosphorus deposits obtained by chemical reduction represent a metallurgical product of unique character, having the structure of an undercooled liquid solution, as shown by x-ray diffraction studies. The transformation from the amorphous to the crystalline structure occurring at 400C has been verified by several groups of independent workers using various techniques.[2] Dr. Read's statement that this transformation does not appear in the equilibrium phase diagram of nickel-phosphorus answers his own question. The phase diagram nickel-phosphorus represents systems which are thermodynamically at equilibrium when studied. Electroless nickel coatings in the "as plated" condition are supercooled solutions which by definition represent a

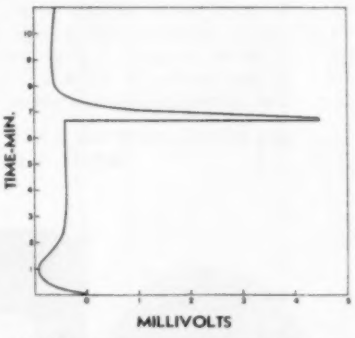

Fig. 23. Time vs millivolts of Chromel-Alumel thermocouples spot welded to transformed and untransformed pieces of randomly plated chemical nickel, connected in opposition and placed in a furnace at 400C.

metastable state. The practically instantaneous transformation at 400C for the assumed process

$3\ Ni + P \rightarrow Ni_3P + \Delta$ ($\sim$ 1000 cal/gm-mole)

represents an exothermic irreversible reaction associated with a decrease in entropy. This state after heat treatment at 400C will now appear in the nickel-phosphorus phase diagram as a solution of Ni_3P in nickel. The experimental technique and measured data for this transformation at 400C is illustrated in Figure 23. It can be interpreted from this graph that the time required to complete the transformation after reaching equilibrium with the furnace is approximately 90 seconds at 400C. Other workers using a different technique have also established the extreme rapidity of this transformation.[2] We feel that, given sufficient time, the same transformation can be obtained at temperatures lower than 400C.

WARREN G. LEE
Research Associate

Research & Testing Laboratory
General American Transportation Corporation
150 West 151st Street
East Chicago, Indiana

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2. K. T. Ziehlke, W. S. Dritt, C. H. Mahoney, "*Heat Treatment of Electroless Nickel Coatings*", Unclassified Research and Development Report K-1308 (Union Carbide Nuclear Company, U. S. Gov. Contract W 7405 eng. 26).
3. *ibid.*
4. G. Gotzeit, *Plating*, 46, 1158 (1959).

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L—603. METAL FINISHING CHART—Conversion Chemical Corp. has issued a new, easy reference chart for metal finishers. This chart lists approximately 50 Kenvert items, including chromate treatments, bright dips, brighteners, plating additives, pickling and cleaning specialties, and protectives; all designed for specific applications. Products not offered in powder form are available in non-returnable packages for easy customer handling and inventory.

L—604. ABRASIVE MEDIA—A 4-page bulletin, "Abrasive Compounds in Barrel Finishing", is available from Frederick Gumm Chemical Co.

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L—605. NON PITTER—A new surface active liquid, called Metex Non Pitter N-17 is fully described in Technical Data Sheet No. 81, a three-page usage and instruction sheet prepared by MacDermid Incorporated, Waterbury, Connecticut. Metex Non Pitter N-17 is used in cyanide copper plating baths to overcome causes of blotchy plate and some causes of pitting, as well as to reduce fuming and dragout.

L—606. CHEMICALS—Vitro Chemical Co. has issued a new brochure, containing complete technical information about various chemicals, metals and alloys of the rare earth group of elements, thorium, scandium and yttrium. These 14 elements are today achieving considerable commercial importance in missile development, glass polishing, ceramics and atomic energy. In addition to potential uses, it describes manufacture and lists detailed properties and chemical analysis of more than 50 products, several of which are now available for the first time on a commercial scale.

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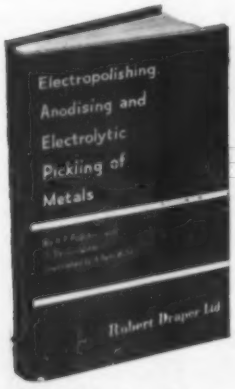

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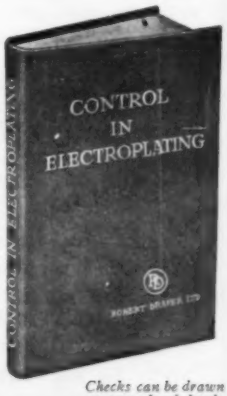

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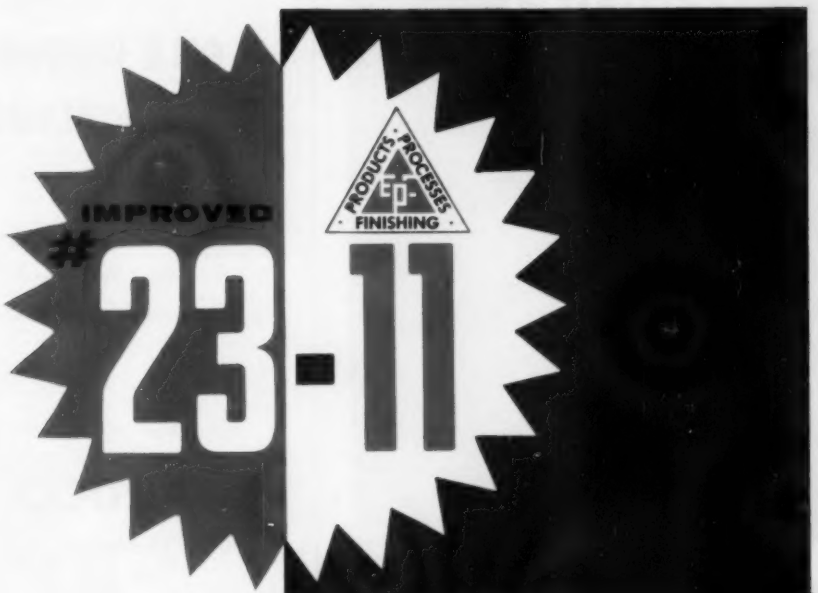

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PERSONALS

A. L. BARAK, treasurer and assistant secretary of the Udylite Corp., retired effective with the election of his successor at the company's annual meeting April 28.

Mr. Barak, who has served in the financial department of Udylite for 25 years, is a resident of Grosse Point Woods, Mich. Before being elected treasurer and assistant secretary in 1953, he served as assistant treasurer and auditor. He is a graduate of Dartmouth College, Hanover, N. H.

A. L. Barak

J. J. Rice

JOSEPH J. RICE of Grosse Point Woods, Mich., has been elected treasurer of the Udylite Corp. He succeeds A. L. Barak who retired. An employe of Udylite since 1946, Mr. Rice was previously controller, assistant secretary and assistant treasurer.

Mr. Rice joined Udylite immediately after five years of wartime service in the U. S. Army Artillery. During his military career, he rose in rank from private to major, and served as a battery commander in the Philippine Islands.

A pre-war graduate of Detroit Business University (BS, 1938) Mr. Rice continued studies for two years after his discharge at the evening school of the University of Detroit.

♦

DR. GEORGE C. HARRISON JR., who resigned from the Pennsalt Chemicals Corp., shortly before the first of this year, recently joined Amchem Products, Inc., Ambler, Pa. At Amchem, he is specializing in protective coatings for steel in the Metalworking Chemicals Division.

Dr. Harrison was graduated from the University of Pittsburgh, in 1951, with a degree in chemistry. He received his Doctorate, in inorganic and physical chemistry from the same university, in 1956.

♦

ROBERT W. TAYLOR has been transferred to Kansas City, Missouri, as the technical sales representative for the Metalworking Chemicals Division of Amchem Products, Inc. He will be attached to the Central District Office, located in St. Joseph, Missouri. His new territory will include Missouri, Kansas, Colorado and Nebraska.

♦

J. H. GOODYEAR, regional technical adviser for Olin Aluminum, has left the company to open his own consulting firm. The new organization will have offices at 320 West Main Street, Lansdale, Pennsylvania and will deal with problems in anodizing, organic finishing, painting, plating, special finishing and plant layout for the foregoing processes.

B. F. WALRAVEN has been transferred to the Kansas City sales and service staff of the Davies Supply and Manufacturing Co., of St. Louis. Mr. Walraven, formerly assigned to engineering and sales work in the St. Louis area, will cover Oklahoma and parts of Kansas and Missouri.

B. F. Walraven

W. J. Bennett

WILLIAM J. BENNETT has been named national field sales manager of the Coated Abrasives division of Behr-Manning Co., a division of Norton Co.

The industrial sales organization has been regrouped into eastern and western regions. The regional sales managers are, respectively, **VICTOR F. PERREAULT** and **ARTHUR W. BELL.**

Mr. Bennett, who makes his home in Albany, N. Y., has been eastern regional sales manager of coated abrasives for the past five years. He has been with Behr-Manning for 21 years. He became resident product engineer at Cleveland in 1944, responsible for developing the flat sheet polishing program. In 1947 he

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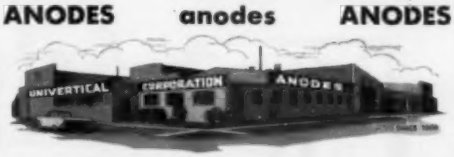

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became sales manager of the Detroit division and in 1950 was transferred to the main offices at Troy. Since then he has served as manager of product engineering and of industrial trades sales.

♦

W. RAYMOND BURROWS JR., formerly sales manager of R. E. Dietz Co., has been engaged as manager of the market research branch of The Carborundum Co.

Mr. Burrows succeeds Jan Braltz who resigned April 1. Mr. Burrows holds an AB degree from Hamilton College and a Master of Business Administration degree from Harvard Graduate School of Business Administration.

He started his business career with Dietz in 1951 as assistant to the president. He was subsequently appointed assistant sales manager then promoted to sales manager of one of the company's principal divisions in 1957, the position he held prior to becoming manager of market research for Carborundum.

♦

FRED M. GILBERT, sales representative with Diversey Corp. for the past three years, has been assigned by Sel-Rex Corp. to its Chicago Office as technical sales representative. Mr. Gilbert will service customers for Sel-Rex precious metal plating processes, as well as rectifiers, plating equipment and supplies produced by The Meaker Co., a wholly-owned subsidiary.

Among the technical and sales positions held by Mr. Gilbert during his nearly 15 years in the metal finishing industry are: 4 years as vice president, Chromium, Inc.; 2 years with Chromium Corp. of America as plating foreman; and process engineer for quality control with General Motors. His father was president of a job plating shop for over 20 years and Mr. Gilbert was solving metal finishing problems while still in his teens. He studied chemical engineering at Bowdoin College and mechanical engineering at the University of Connecticut. His assigned territory includes: Michigan, Indiana, Ohio and Kentucky.

Long active in American Electroplaters' Society activities—he is currently second vice president of the Kansas City Branch of which he was a charter member, he has also served in various other capacities including branch librarian.

F. M. Gilbert

R. L. Brenneman

RICHARD L. BRENNEMAN, formerly chemical engineer with Melpar, Inc., Falls Church, Va., has been appointed to the technical service staff of Sel-Rex Corp. Mr. Brenneman will headquarter at Sel-Rex's executive offices in Nutley, N. J., and will be given installation and service assignments.

During his more than four years with Melpar, Mr. Brenneman had such assignments as: control and analytical work, prototype plating; electronic hardware finishing; experimental work on semiconductor products; and was also group leader in charge of printed circuit pilot

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plant production, including precious metal processing. He studied chemical engineering at the University of Virginia, is currently undergoing an extensive training and indoctrination at the firm's Nutley laboratories.

♦

F. M. METCALFE has been named division sales manager and **C. L. MURPHY** has been named division marketing manager of Minnesota Mining & Manufacturing Co.'s coated abrasives and related products division. The appointment of **W. E. MARSDEN** to Eastern region sales manager for the division has also been announced.

Mr. Metcalfe, who will be responsible for all field sales operations, has been with 3M since 1935, and was regional sales manager headquartered at the New York area office before assuming his new duties. In his new post he will headquarter in St. Paul.

Mr. Murphy who, will be responsible for all divisional marketing activities was industrial trades sales manager for the division before being named to his new post. He joined 3M in 1942.

Mr. Marsden was automotive sales manager before assuming his new duties. He has had 20 years of sales experience with 3M.

♦

DR. BERNARD AGRUSS, formerly head of the battery department and electrochemical department at the National Lead Co. Research Laboratories in Brooklyn, New York, has now become affiliated with the research department, Allison Division, General Motors Corp. in Indianapolis, Indiana as section chief, Physical Chemistry Section.

♦

A. F. GRIFFITH has been named manager of electrical and metallurgical applications; **P. J. HASTINGS,** manager of nuclear applications, and **J. J. SHERLOCK,** manager of mechanical applications, in the industrial carbon marketing department of National Carbon Co., division of Union Carbide Corp.

Mr. Griffith was graduated from Lafayette College in 1948 with a Bachelor of Science degree in mechanical engineering and joined National Carbon's marketing department in New York in 1949. Since 1957 he has been responsible for industrial carbon and graphite sales in the Cleveland area.

Mr. Hastings was graduated from Worcester Polytechnic Institute in 1942 with a Bachelor of Science degree in electrical engineering. He joined National Carbon Company in 1947, and spent several years in industrial sales in the Pittsburgh area before returning to Cleveland in 1957.

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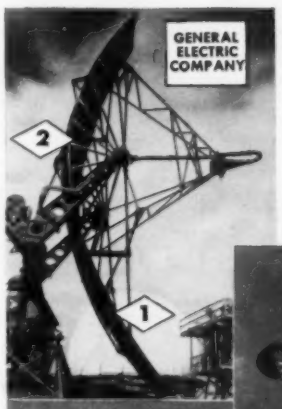

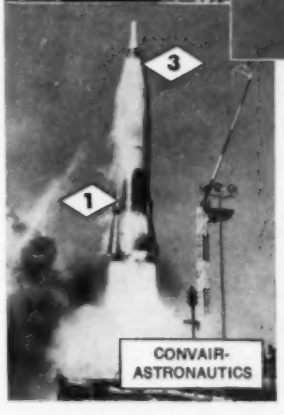

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Mr. Sherlock is a native of Cleveland, and was graduated from John Carroll University in 1950 with a Bachelor of Science degree in chemistry. He joined National Carbon Company in 1952, and has been engaged in industrial sales work in Buffalo and Cleveland.

♦

JOHN D. JOHNSON has been appointed by Frederic B. Stevens, Inc., as district manager in charge of sales to the metal finishing industry in the state of Michigan.

A native of Detroit, Mr. Johnson has been associated with Stevens for ten years. He holds a mechanical engineering degree from the University of Detroit (Class of '48), and is a member of the American Electroplaters' Society and the Engineering Society of Detroit.

J. D. Johnson

W. G. Millman

WILLIAM G. MILLMAN has been appointed assistant technical service manager of the Electrochemical Division of Lea-Michigan, Inc. Mr. Millman will be responsible for technical service in connection with bright and high speed electroplating processes.

TED J. WIECZOREK has joined Enthone, Inc. as a senior chemist in the Enthonics Laboratory. He will work on both research and technical service projects.

Mr. Wieczorek has had over 20 years of experience in metal finishing serving in such capacities as development chemist, finishing superintendent, job shop general manager, sales engineer and consultant. He has been employed by the Stanley Works, New Britain, Conn.; the Chemical Corp., Springfield, Mass.; and, most recently, by the Royal Metal Manufacturing Co. of Plainfield, Conn. as finishing superintendent.

T. J. Wieczorek

T. K. Friedt

THEODORE K. FRIEDT has been elected vice president and assistant general manager of United Platers, Inc.

Mr. Friedt, 32, started with the company in 1948 as a maintenance man. He served as production foreman, superintendent, and plant manager before being named to his new post.

He was graduated from Florida Military Academy and attended the University of Miami and Kalamazoo College.

♦

RICHARD A. FELLOWS has been elected vice president of the Udylite Research Corp. He has been general manager since 1958.

Mr. Fellows joined the Bright Nickel Corporation as a research chemist one year before it became the Udylite Research Corp., a subsidiary of The Udylite Corp. Prior to his appointment as general manager, he was a service engineer in the customer service department.

A graduate of Adrian College, Mr. Fellows is a member of the American Chemical Society, Electrochemical Society and the American Electroplaters' Society.

♦

DANIEL H. ROSS who has completed 1½ years training in MacDermid laboratories, has been assigned to work with **CLAUDE WEEKLY**, manager of MacDermid's western division, MacDermid Pacific Inc.

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J. FRED GREGAN has been appointed general manager of Cosmo Wheels, Inc., 1019 West Fulton Street, Chicago, recently established national marketing organization for the Chicago Rubber Company, Inc.

Mr. Gregan has been with Atlantic India Rubber Works, Felt Products Co. and plant superintendent of the Chicago Rubber Co., Inc., Waukegan.

♦

FRANK W. WELLING has been elected executive vice president and treasurer of Commercial Filters Corp.

Prior to joining the company in 1959, Mr. Welling served as vice president and director of W. A. Case & Son Manufacturing Corp., Buffalo. He previously served in a similar capacity with Univis Lens Company, Dayton, Ohio, and was also associated with Booz, Allen & Hamilton, in New York and Chicago.

GILBERT H. TEWINKLE was elected assistant treasurer. He became associated with the company two years ago.

♦

DONALD E. WELLMAN has been appointed to the position of division sales manager—Canada for Kelite Corp.

Mr. Wellman, who was previously product manager—metal finishing for Kelite (Canada) Ltd. will be responsible for all Canadian sales. His headquarters will be in London, Ontario.

Kelite anticipates the establishment of a manufacturing facility in London later this year.

D. E. Wellman

S. H. Duff

JOSEPH H. DUFF has been promoted to technical manager of Graver Water Conditioning Co., New York, division of Union Tank Car Co. Mr. Duff, who has been with Graver for ten years, was formerly assistant technical manager. He succeeds **MARVIN LANE** whose appointment as head of the company was recently announced.

The new technical manager holds a BS degree in chemical engineering from the Newark College of Engineering. He has been in the liquid treatment field since 1946 when he completed active service in the armed forces. He has made many contributions to the advancement of liquid technology including work on the expanded use of mixed-bed demineralizers, improvements in high-rate clarifiers and hot-process systems, and various process applications. Some of his recent projects have been in the development of new underdrains and regeneration systems for ion exchange equipment.

♦

FRANK J. WOODS has been appointed director of sales for Allied Chemical's General Chemical Division.

With the division 22 years, Mr. Woods has been heavy chemical sales manager for the past ten.

During World War II he served as supervisor of industrial relations for a subsidiary, General Chemical Defense Corp., which was operated for the government in Point Pleasant, West Va.

F. J. Woods

R. F. Ryan

ROBERT F. RYAN has received appointment as midwestern operating division manager of Kelite Corp.

Mr. Ryan will manage midwestern region sales and will co-ordinate the technical and internal control departments at Kelite's Chicago facility, where he will be senior executive.

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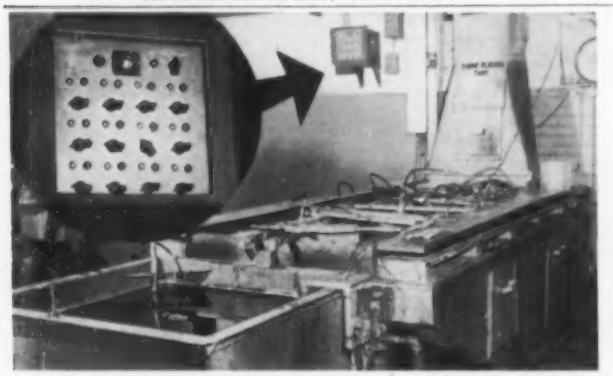

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Upon receiving his MS in organic chemistry from North Dakota Agricultural College, he joined The Dow Chemical Co.'s technical service and development department, was later appointed product development manager.

♦

WILLIAM T. COLLINS has been elected assistant secretary of Michigan Chrome and Chemical Co.

Mr. Collins served overseas with the Army from 1943–1946 in Hawaii, the Philippines, and Okinawa. He was graduated from the University of Michigan in 1950 with a degree in economics. Mr. Collins has been employed by Michigan Chrome since 1950.

♦

M. JAMES CAMPBELL has been appointed assistant director of development for Solvay Process Division, Allied Chemical Corp., Syracuse.

In his new position Mr. Campbell will play a key role in guiding the division's development work on new processes, markets and products.

A graduate of Lehigh University, Mr. Campbell holds a degree in chemical engineering. Since joining Solvay in 1939, he held a variety of supervisory positions in Solvay's Syracuse, New York plant and became manager of that plant in 1958. Last year Mr. Campbell was named assistant to Solvay's vice president.

HERMANN E. MAACK

Hermann E. Maack, president of the Pottstown Plating Works, Pottstown, Pa., died Thursday, April 28 at Pottstown Hospital. He was 71 and lived at Dogwood Farm, Pottstown RD 1.

Mr. Maack was a member of the Philadelphia Branch, AES, since June 27, 1941. A generous contributor to Branch functions, he encouraged and supported AES membership of his employes.

He also was a member of the National Association of Metal Finishers and a former director of the Montgomery County Manufacturers Association.

Surviving are his wife, the former Dorothee Melcher; two sons, Herbert and H. Ralph, the latter a Philadelphia Branch member; seven grandchildren.

RALPH A. McKINNEY

Ralph A. McKinney, retired sales executive of Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. died April 17 at his home in Cleveland at the age of 90. Mr. McKinney left the steel industry to join the Manhattan Rubber Division in 1911 as a salesman and shortly after became Pittsburgh branch manager. Later he organized the company's first Central Region with headquarters at Pittsburgh and branch offices at Cleveland, Buffalo and Wheeling.

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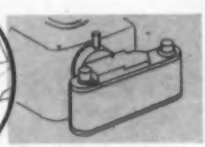

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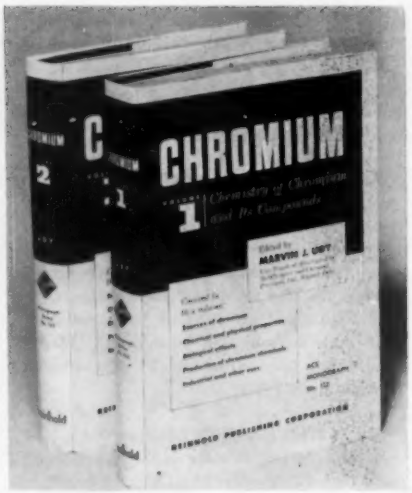

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ABOUT THE EDITOR

MARVIN J. UDY is widely known for his process development work in chemical and metallurgical fields. His process for cadmium plating formed the basis of the Udylite Process Co. of Detroit. For several years he investigated and commercialized a process for the electrodeposition of chromium and chromium plating. He has also developed a process for treating low-grade chrome ores which has resulted in a complete line of exothermic ferroalloys and metals. These and many other chemical and technological achievements eminently qualify Udy to supervise the preparation of this exhaustive reference work.

AMERICAN ELECTROPLATERS' SOCIETY
445 Broad Street, Newark 2, New Jersey

PATENT ABSTRACTS

(Continued from page 718)

2,907,104, 10/6/59—SOLDERING ALUMINUM—J. Brown, Monrovia, and E. Newton, West Covina, California.

Dip the part into a vessel containing a lower layer of hydrofluosilicic acid and an upper layer of rosin in alcohol. Withdrawal of the article provides an active surface protected from oxidation by a rosin coating.

See also 2,907,105, granted Rihei Ohmi of Ichikawa City, Japan, describing a flux-less solder for aluminum composed of 2.3–3.5 per cent Cu, 6–7 per cent aluminum and 89.5–91.5 per cent of zinc (99.995) with 1 claim.

3 claims, figure.

2,907,649, 10/6/59—ALUMINUM CLEANING COMPOSITION—B. Berkeley and A. Petersen, assignors to Commonwealth Products, Inc., Kalamazoo, Michigan.

A powdered aluminum cleaning composition is described as consisting of 1–20 parts of oxalic acid, 1–20 parts of sodium bifluoride, 1–20 parts of soap, and 96–39 parts of a fine abrasive.

4 claims.

2,908,117, 10/13/59—ROTARY POLISHING ELEMENT—E. Hall, assignor to F. L. and J. C. Codman, Rockland, Massachusetts.

A finger-type buff wherein the fabric carries an abrasive is claimed.

9 claims, figure.

BOOKS

Remittance must accompany all book orders placed with AES Headquarters.

Modern Science Dictionary (1959) Edited by A. Hechtlinger, 784 pages. Nonmembers $10.00. AES Members $9.00.

This dictionary contains over 20,000 definitions of scientific terms used in astronomy, biology, chemistry, geology, metereology and physics. The definitions are clearly written in simple language and should be very helpful to a reader not conversant with a particular field. Simple formulae are given for most chemicals, and units of measurement where applicable.

R. A. Ehrhardt

Photomicrography of Metals, 44 pages, 50 cents. Order directly from Sales Service Division, Eastman Kodak Company, Rochester 4, N. Y.

This new 46-page book may serve as a short course in photomicrography for those interested in reviewing the latest techniques in this field.

It is illustrated with photographs, charts and graphs. Written in layman's language, the booklet contains six major sections which include detailed information on the metallographic microscope, illumination, filters in metallography, photographic materials, exposure determination, and processing and printing.

The optics of metallography are discussed at length, including specific suggestions and recommendations for matching proper equipment to various applications. Practical information is given on determining exposures for both black-and-white and color materials used in photomicrography. Another section probes into filters and their use in connection with various light sources, specimen types and objectives.

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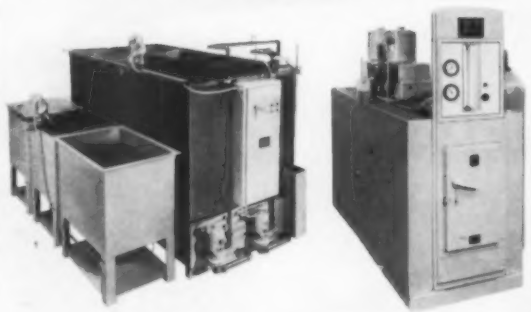
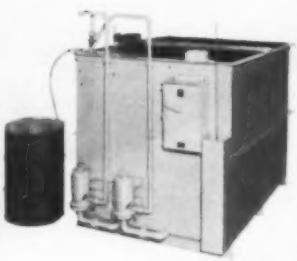


Chromator

Sulfonator

for CYANIDE

Econo-treat



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2,908,557, 10/13/59—ETCHING COPPER—O. Black and L. Cutler, assignors to R.C.A. Delaware.

An etching solution is described as consisting of 100 to 300 grams/liter of cupric chloride, 3 to 5 g/l of hydrogen ion and an oxidizing agent. Regeneration of the solution is described.

9 Claims.

2,908,589, 10/13/59—FLAME SPRAYING AN ALLOY—G. Gutzeit and J. Spraul, assignors to General American Transportation Co., Chicago, Ill.

Flame spraying of a nickel (88–94 per cent)—phosphorous (6–12 per cent) alloy at 880°C is described.

11 Claims, figure.

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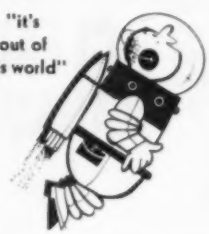

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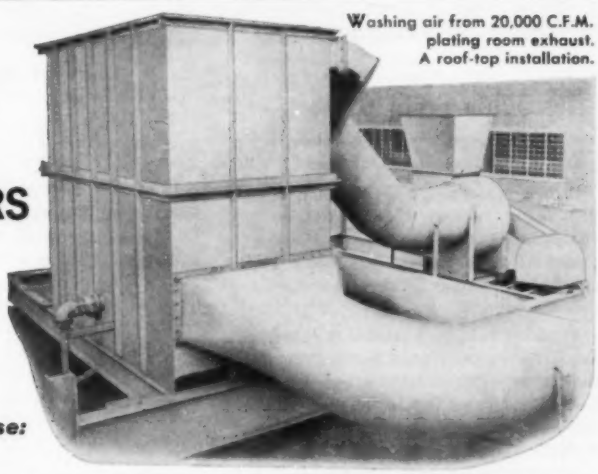

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BRANCH NEWS

Total AES Branches U. S., Canada, Australia, June 1, 1960—58.

BALTIMORE-WASHINGTON

Wysong Receives Presidential Honor

A cocktail party, banquet and dance were held on the night of April 9, at Marty's Park Plaza in Baltimore.

The traditional presentation of the "Order of the Pot" was very capably handled by National Past President **Ken Huston** who presented the "Pot" to National President **Ralph D. Wysong.**

Over 100 members and guests enjoyed the "ritual" and after a brief talk by President Wysong the remainder of the evening was devoted to dancing and other social activities that lent themselves to a most enjoyable evening.

BLUE RIDGE

Arthur Logozzo on Hard Chrome Plating

The regular monthly meeting was held April 1, at the Elks Club in Roanoke, Virginia. The attendance included 24 members and guest. **Dr. Nelson Murphy** presided at the business meeting. Nominations were taken for officers for the coming year. The elections will be held at the May meeting.

After the business meeting, **Arthur Logozzo** spoke on "Hard Chromium Plating." Mr. Logozzo is with Nutmeg Chrome Corporation, West Hartford, Conn. Films were shown depiciting all phases of chromium plating. Everyone enjoyed the talk which covered everything from metal preparation to the finished product.

Donald H. McGee
Secretary

BRITISH COLUMBIA

Successful Plating Students Receive Certificates

A general meeting was held at the Lougheed Hotel, Lougheed Highway, North Burnaby, B. C. on Wednesday, March 30. Following cocktails and dinner, the meeting opened with President **Nelson Shepherd** in the chair.

The president presented Certificates to all successful students of the Night School Course. Congratulations were extended to them by the instructor, **W. Kellerman,** who thanked A.B.C. Plating and Coast Testing Laboratories for their help in making the course a success.

A report was given by G. Smith regarding the Night School course, in which he told the meeting that he had copies of the course, examination paper and reports, available for the membership to see. The president advised the meeting that he had received a letter from **John P. Nichols** regarding his visit to Vancouver, and that therefore the next meetings had been arranged at the Lougheed Hotel, for April 13 and May 3, the latter date to fit in with Mr. Nichols' visit.

The president then presented the nominating committee's nominations for officers for the coming year. The election will take place at the April meeting.

Mr. Shepherd introduced the speaker, **Mr. Hamper** of the B. C. Safety Council. Mr. Hamper outlined the organization of the Council and spoke on safety in the home, industry, school recreation, traffic, etc. and discussed compensation assessments which vary from industry to industry depending on the rate of frequency of accidents. He referred to allergies, and to the Accident Prevention Manual for Industrial Operation, 4th edition, as "the bible." He mentioned awards given by B. C. Safety Council, eligibility of the AES to join, and covered other points concerning "high" and "low" hazards in industry.

Doug Armstrong
Secretary

BRITISH COLUMBIA

New Officers Elected; Nichols to Speak at May Meeting

A general meeting was held on Wednesday, April 13, at the Lougheed Hotel, N. Burnaby. Following cocktails and dinner, President **Nelson Shepherd** welcomed guests and members. One new member was admitted.

President Shepherd opened the meeting for further nominations for the 1960/61 Executive. The election resulted in the following slate of Branch officers for the coming year: **Gordon Smith,** president; **W. Kilby,** first vice president; **H. Schenke,** second vice president; **C. Schlossareck,** secretary; **J. Hurford,** treasurer; **W. Marquardt,** program director; **V. Huene** and **G. Caslor,** board of managers. For the important post of bartender—**J. Lee,** assisted by **R. Wolloschuk.**

Reference was made to the forthcoming visit to this Branch of **John P. Nichols,** the National Executive Secretary of the AES. L. Lee moved that W. Marquardt be appointed moderator for the question-and-answer-period which would follow Mr. Nichols' address to our meeting.

Doug Armstrong
Secretary

BUFFALO

Ruhly Speaks on Rack Coatings; Shapiro Elected President

The Buffalo Branch held its April meeting Friday, April 1, at the Niagara Manor, Buffalo, N. Y., with 30 members and 2 guests in attendance.

Librarian **Dick Davis** introduced the speaker of the evening, **King Ruhly,** sales manager, Chemical Divison of the Michigan Chrome & Chemical Co., who spoke on "Electroplating Rack Coating and Stop-Off Materials."

Officers elected for the 1960–61 season are as follows: President, **Harold Shapiro;** first vice president, **John Donaldson;** second vice president, **Dick Davis;** third vice president, **Robert Lienert;** secretary, **Robert Eich;** treasurer, **Roger Brown;** librarian, **John Tiebor,** sergeant-at-arms, **Ray Blechinger;** board of managers, **Bert Kirchoff, Rolland Campbell** and **John Scholterer.**

An applicant was elected to membership.

The May meeting concludes the activities of the Buffalo Branch until Sept. 9.

Robert E. Lienert
Secretary

CAPITOL DISTRICT

Combs Talks on Chromium Plating

The March 7 meeting of the Capitol District Branch was held at the Circle Inn, Latham.

Preceding the business meeting **E. L. Combs** of Diamond Akali gave a very interesting talk on chromium plating. Due to the importance of the subject to most of the members there was quite a prolonged question and answer period.

Bob Wolf, chairman of nominating committee announced the committee's nominees for office for the coming year.

The position of recording secretary was created to assist the secretary in various duties.

Edward Legere

CAPITOL DISTRICT

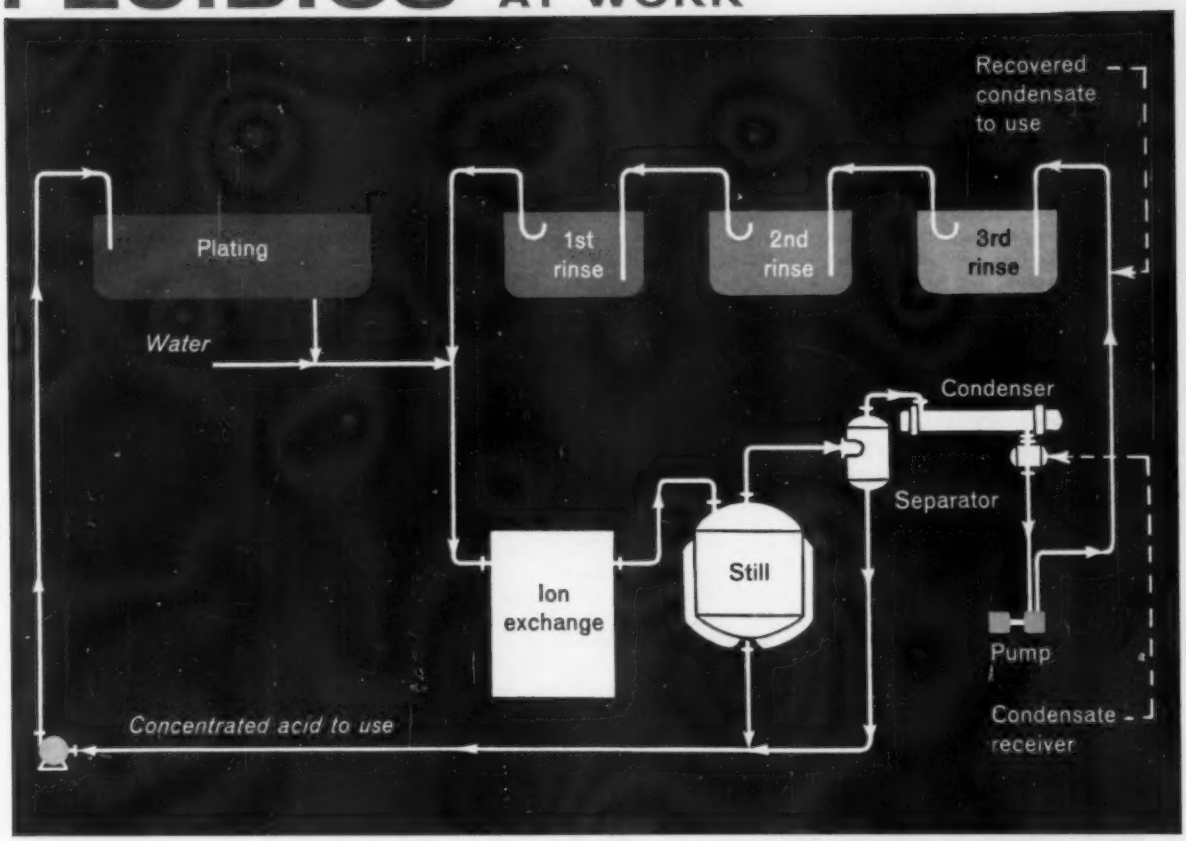
Beals Discusses Conversion Coatings

The April meeting of Capitol District Branch was held at the Circle Inn, Latham.

BRANCH SECRETARIES

Branch News is required of all Secretaries monthly by AES Bylaws. First of the month is Branch News deadline for next PLATING issue. Any items on hand on that date will be carried in that edition. Later arrivals will appear in the issue immediately following. In reporting talks given by speakers before the Branch, please give titles of the talks, the speakers' full identification and any other pertinent information of interest to other Branches and PLATING's broad readership.

FLUIDICS* AT WORK



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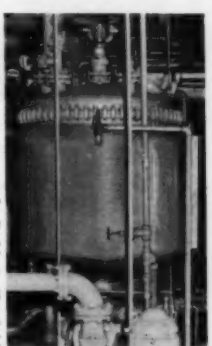

In other parts of the system stainless steel generally does the job efficiently and economically.

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Art Eisner, chairman of outing committee, reported that the outing was to be held on Saturday, June 11.

The secretary read the nominating committee's list of officers for the 1960–61 term. The secretary then cast 1st ballot in favor of same. It was then 2nd and carried by the society.

The 1960–61 officers elected are: President, **Zygamond Nash;** vice president, **Edwin Frieberg;** first vice president, **Adam Osielski;** secretary, **Edward Legere;** recording secretary, **Burt Finger;** treasurer, **Mike Guaneri;** board of managers, **John Green, Art Eisner, Robert Hill.**

Harlo Beals, sales supervisor of Amchem Products, was introduced by Bob Hill. Mr. Beals gave a very interesting talk on conversion coatings, during which many questions were asked.

Edward Legere

CHICAGO
Sunbeam Plant Tour
First for Chicago Branch

On Friday, April 8, members of the Chicago Branch made their first plant trip, a visit to the Sunbeam Corp. The members met at Plant No. 3 at 1824 South Laramie Avenue, between 1:00 and 1:30 p.m., and were escorted in groups of twelve through the plants by a guide. The following operations were visited in the plants: (1) a strip polishing line (2) buffing and coloring of fry-pans (3) percolator polishing and buffing (4) toaster shell buffing (5) clipper shaver comb buffer (6) automatic chrome plating (7) automatic copper plating (8) barrel nickel plating (9) automatic nickel plating (10) combination of nickel and automatic chrome plating. The tour was highly educational and very interesting in showing the finishing operations on the various products. **Barney Case,** finishing superintendent and planner of the tour, conducted a question-and-answer period regarding the various operations, after the refreshment period.

The members then met at Petricca's Restaurant, 3237 North Harlem Avenue for dinner and business meeting. Nine members were accepted and approved by the board of managers. **Paul Glab** urged that members promptly pay their dues and if not paid, members will be notified in July of their suspension. **Father Roll,** a member of the Chicago Technical Societies Council, was a guest and spoke on the functions of the Council. The Council (1) helps the youth to select an area of profession in which they may be interested (2) provides lectures at the Museum of Science and Industry on Sundays for the general public on various interesting subjects and (3) helps the individuals of the various societies which belong to the Council. The Council prints a register of all professional members belonging to the various technical societies and the Sci-en-tech News. The Council will try to establish a Technology Center where the technical societies can meet and hold their technical sessions.

Scott Modjeska installed the officers for the coming year: President, **Matt Dassinger;** first vice president, **Rudy Hazucha;** second vice president, **Joseph C. Corre;** secretary, **Paul Glab** and librarian, **Simon P. Gary.** The board of managers consists of **Charles Geldzahler,** chairman; **Richard Connors, Edward Stanek, Bob Waits** and **Christopher Marzano.** The board of managers was asked to select a meeting place for the coming season by the July meeting. The Chicago Branch, as a result of Father Roll's talk, will support the Chicago Technical Societies Council. The next technical meeting will be held at Petricca's on Friday, June 10, 1960.

Christopher Marzano
Publicity Chairman

COLUMBUS
Tour Westinghouse Appliance Division

On April 1, 35 members of the Columbus Branch were entertained by a plant tour and dinner. The program was arranged by **Marvin Pingel,** with the compliments of the Appliance Division of Westinghouse Electric Corporation. The tour offered a close view of the entire assemly process for refrigerating units.

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Annal Branch elections for 1960-61 officers were held at a short business meeting prior to the tour.

Leslie D. McGraw

DALLAS—FORT WORTH
Murray Speaks on Spotting Out and Tarnish Prevention

The regular meeting was held on Wednesday, April 20 at Howard Johnsons' Turnpike Restaurant with 25 members and guests in attendance.

Following the Fellowship Hour and dinner, President **M. E. Browning** called the meeting to order. The first order of business was the reading of a report of The Science Fair where **D. L. "Don" Allie** attended in behalf of the local Branch. Allie told of great work that the Science Fair is doing for the nation's youth who are scientifically inclined. The door prizes were won by **J. C. Bessonette, B. L. Remaley, H. E. Patterson,** and **R. W. Payne. E. R. "Ray" Rinhart** reported to the group that he won a medal from The Boon and Crocket Club for bagging the largest antelope of the century.

The election for new officers was held, and the following men were elected: **W. L. "Bill" Aves,** president; **Fred Howard,** first vice president; D. L. "Don" Allie, second vice president and treasurer; **James H. Weaver,** secretary; **Douglas L. Cox,** librarian; **Jack D. Haler,** recording secretary; **Dr. Thomas Franklin,** research manager; and M. E. Browning, regional representative.

Don Allie introduced our guest speaker of the evening, **William K. Murray,** manager of marketing of Enthone Inc., who gave a very interesting talk on "Spotting and Tarnish Prevention." After the talk a question and answer session followed.

T. E. Betz
Recording Secretary

DENVER
Chemical Milling Viewed at Martin Plant

The Denver Branch met April 20 at the Martin Co., Denver plant. Following dinner in the cafeteria the group was conducted on a tour through the metal finishing department and quality control laboratories. Of considerable interest was the equipment and process for chemical milling of aluminum. This was the first view for most of the group of this new tool for the metal fabricating trade, and all were impressed with the possibilities.

Following the tour a short meeting was held. **Bob Martin,** president, announced the retirement from active participation in metal finishing of **Owen Towner** and presented him with an engraved plaque honoring him for his 50-years-plus activity in the metal finishing field.

The nominating committee presented a list of candidates for offices, which was approved by the meeting.

A movie was shown which covered the development of the Titan missile. To conclude the evening the group was taken by bus to view the missile testing stands.

Elmer Schuster
Secretary

DETROIT
Scott Talks on Organic Finishes

Detroit Branch met on April 1 at the Statler-Hilton Hotel in Detroit. **Vincent Cassidy** of the Ford Motor Co. served as educational chairman. The guest speaker of the night was **F. L. Scott** of the Metal & Thermit Corp. of Carteret, New Jersey. He talked on "Organic Finishes."

Mr. Scott is a graduate of Boston College with an MS in Chemistry. Prior to joining Metal & Thermit as Technical Manager of the Coatings Division, Mr. Scott was associated with the BB Chemical Company, Boston, and the Coatings Division of United Chromium, Inc.

Mr. Scott's informative talk was well received by the many members who turned out for the meeting.

April 1, was officially designated "Sustaining Members Night", and that important segement of the AES was honored for the substantial contribution it has made to the progress of the industry.

William G. Anderson
Publicity Chairman

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INDIANAPOLIS

Faust Presents Paper on Metal Cleaning

The Electrochemical Society met with the Indianapolis Branch on Tuesday, April 5, at the Construction League. Fifty-three attended the dinner and about 20 more came for the program. **Les Reynolds,** president, presided and asked for reports. A report on the coming Tri-State meeting was given by **Quentin Shockley.** Our president, who is also national membership chairman, asked that consideration be given by the Tri-State to appoint a membership committee within the Tri-State to help get new members.

Dr. Abraham Max, one of our past presidents and also a member of the Electrochemical Society gave us some interesting facts about our speaker, but turned the actual introduction over to **Dr. Ralph Haberecht** who introduced **Dr. Charles L. Faust** of the Battelle Memorial Institute. His subject was "Some Aspects of Metallurgical Cleaning."

Dr. Faust showed many slides to illustrate his talk. The slides were blown up 40,000 times to show impurities of buffed surfaces of metal. He presented information on electropolishing, and showed various flaws in metol after electropolishing and also after plating. Any surface coating will be affected by the condition of the surface metal. There is no such thing as *a* nickel plate or *a* copper plate, but at least ten different properties in nickel and many in copper. The meeting proved very interesting and many questions followed the talk.

Three applications for membership were read and will be voted on at the May meeting.

Edna Rohrabaugh
Secretary

LOS ANGELES

Steyer Talks on Corrosion

The Jan. 13 meeting was called to order by First Vice President **Frank Virgil,** in the absence of President **Hetz.**

Eight applicants for membership were introduced.

Librarian **Marjorie Farmer** introduced Prof. **Steyer,** who gave an interesting talk on the Electrochemical Aspects of Corrosion.

H. K. Hunt
Secretary

LOS ANGELES

Owens on Anodized Coatings; Regional Proposal Heard

The Feb. 10 meeting was called to order by President **Hetz.**

Vice President **Virgil** introduced two applicants for membership. Seven men were accepted as members.

George Hetz and **Frank Eddy** reported that the Convention Committee has most of the details settled.

The secretary read a letter form the Phoenix, Ariz., Branch requesting Los Angeles, San Francisco, Portland, Seattle and Denver to form a regional AES group. Secretary **James Weaver** of Phoenix requested that we act on the suggestion and reply.

Stu Krentel suggested an amendment to our bylaws for two elective assistant librarians, who, with the librarian, will serve as an educational committee. A proposed amendment will be acted on at our next regular meeting.

Librarian **Marjorie Farmer** introduced **Ellis Owen,** of Firestone Missile Systems Div., who talked on Testing Hard Anodized Coatings.

H. K. Hunt
Secretary

LOS ANGELES

Virgil Heads New Officers

The March 9 meeting was called to order by President **Hetz.**

Bill Lidke reported that the handbook needs more advertising—only about one-half the space is sold. No dead line has been set for publication of the handbook.

Larry Henderson reported for the 1960 Convention Committee.

Vice President **Frank Virgil** introduced two new applicants for membership. Two new members were initiated into membership.

It was decided by vote that the amendment be adopted to the Branch bylaws covering two assistant librarians and that they be appointed by the president.

Truman Stoner conducted the election of new officers for the coming year. Those elected for 1960–1961 are: President, **Frank Virgil;** first vice president, **Emmett Babcock;** second vice president, **Harvey Hunt;** treasurer, **Harold Wanamaker;** secretary, **Robert Pooler;** librarian, **Don Baudrand;** board of managers: **Norm McEwan, Clare Ver West, Norman Painter.**

A moving picture was shown.

H. K. Hunt
Secretary

BRANCH LADIES AUXILIARIES

LOS ANGELES

Ladies Committee Extends Greetings

It's almost time again to greet old friends and make new ones, and what better way to start the activities than over a cup of coffee to catch up on the news from other States.

We're very proud and happy to welcome the ladies to our own Golden State with a Brunch at 10:30 a.m., Sunday, July 24, for the wives of the National Society Officers, the Los Angeles Branch Officers wives and our Ladies Committee Chairman in the Boston Room at the Statler-Hilton Hotel.

The Monday, July 25th Luncheon will honor the previous Ladies Convention Chairmen from the other States.

Mrs. L. Truman Stoner
Ladies Commitee Secretary

LOUISVILLE

Round Table Discussion on Cleaning and Plating

Joseph Muscarella called the meeting to order Thursday, March 17, at Hasenour's Restaurant with 25 members and guests present.

The Nominating Committee submitted its choice of officers of the coming year.

Tri-State Committee had nothing to report other than what appeared in the March issue of PLATING.

Frank Lamping, of Oakite Products, Inc., gave a very interesting background of his company and their products. Last year they celebrated their 50th anniversary.

A new member was accepted.

The Annual Round Table Discussion was successful, as always in the past. Members showed much interest. The panel consisted of: Moderator, **A. Oertel,** American Saw & Tool; Zinc Plating, **Herb Kennedy,** DuPont Co.; Cleaning, F. Lamping, Oakite Products, Inc.; General Plating, **S. Beyer,** General Electric Co.

K. C. Reifsteck
Publicity Chairman

MILWAUKEE

Taterzynski Describes AES Research; Linford Talks on Project 12

The 506th regular meeting of the Milwaukee Branch was called to order by President **S. Taterzynski,** March 4, at the Ambassador Hotel. This was a dinner meeting honoring the Branch's Sustaining Members. Representatives of the following Sustaining Member Companies were present as guests of the Branch; Allen Bradley Co., Cutler Hammer Inc., Kohler Co., Milwaukee Plating Co., Acme Galvanizing Co., John Oster Co., Racine Plating Co., Square D Co., S. K. Williams Co.

Fred Padgett, the secretary-treasurer of the Milwaukee Branch, prompted by his acceptance of a new position in Chicago, offered his resignation. It was accepted with a vote of thanks for his service to the Society and with wishes for success in his new endeavor.

Six gentlemen were approved for membership.

The chair appointed a nominating committee consisting of **Frank Marshall,** chairman; **Herman Tessmann, Phil Ritzenthaler, Clifford Peter.**

The president gave a brief discourse on Research in Industry and its Relation to the AES Sustaining Membership Program. It was pointed out that recently a panel of experts in the area of creativity concluded that the unpredictable nature of the creative process makes it alien and

often suspect to management. The majority of the panelists offered many instances where management's insistence on order, predictability and profits provided a procrustean bed for the creative researcher. While several acknowledged the necessity of "creativity within limits" they warned that the limits were too often set by management's conservatism, its preference for the familiar, its over-emphasis on quick financial return and its fear of change, thus creating barriers to basic research.

It was pointed out that the AES Research Program was established to study and find answers to basic questions confronting the metal finishing industry as a whole but too basic and complex to warrant one company bearing the entire cost of research. The AES Research Program benefits were enumerated and it was explained how it was;

1. Providing organized basic research at a minimum cost to individual companies.
2. Providing research with broad talent and without increase of technical manpower to the individual companies.
3. Providing manufacturers of supplies with knowledge to improve their products without the high cost of long-range research.

Thus through AES Research the metal finishing industry gains better products, greater knowledge, new and improved processes.

For his talented leadership as President during the 1958–59 year, Frank Marshall was presented with a Past President's pin.

The speaker of the evening was **Dr. Henry B. Linford,** Professor of Chemical Engineering at Columbia University, who presented a paper on "Standards of Cleanliness Required for Satisfactory Electroplates". Dr. Linford has an impressive professional record, including the Directorship of AES Project 12 since 1949, which has been reported in 12 articles appearing in PLATING and with two additional reports in process of review.

The paper presented was directed toward the cleaning and preparation for electroplating in which measurements were made on the system of nickel from high *p*H Watts bath on copper to determine the order of cleanliness required for good adhesion. The first phase involved the study of oxide films. The completely degreased copper was oxidized under controlled conditions to produce oxide films of various thicknesses. Onto this surface, nickel was deposited from a high *p*H Watts nickel bath and adhesion of the resulting nickel plate was measured by modified Jacquet test. This study was correlated with the results obtained previously on Project 12 which dealt with the fate of the oxide film during electroplating.

The next phase discussed was the effect of hydrophobic soils on the adhesion of nickel plated on copper. Two techniques were employed for obtaining a known quantity of hydrophobic soils, a monolayer, produced by the Langmuir-Blodgett technique, and an evaporation method originally developed by Devaux. Adhesion of the resulting electroplate was discussed as was the effect on the actual mechanism of deposition and a verification made as to one theory for the pitting of nickel plate.

S. Taterzynski
President

MILWAUKEE
Museum Display Considered; Panel Discussion Proves Successful

The 507th meeting of the Milwaukee Branch was called to order by President **S. Taterzynski,** April 1, at the Ambassador Hotel.

A new member was approved.

Clifford Peter reported for the Nominating Committee and submitted a slate of nominees.

Of public relations interest was the suggestion of **Harvey McClellan** that the Branch cooperate with the New Public Museum in planning an animated metal finishing display. This would be an educational display which would serve to promote knowledge of electroplating and the allied arts. The chair requested Mr. McClellan to keep the Branch advised of developments.

Glen Schwemmer reported that arrangements are almost complete for the traditional and popular June Pabst Blue Ribbon meeting. The meeting is to be a dinner and social event, featuring the installation of new officers and honoring of the "Old Timers".

The Educational portion of the meeting consisted of a Panel Discussion staffed by

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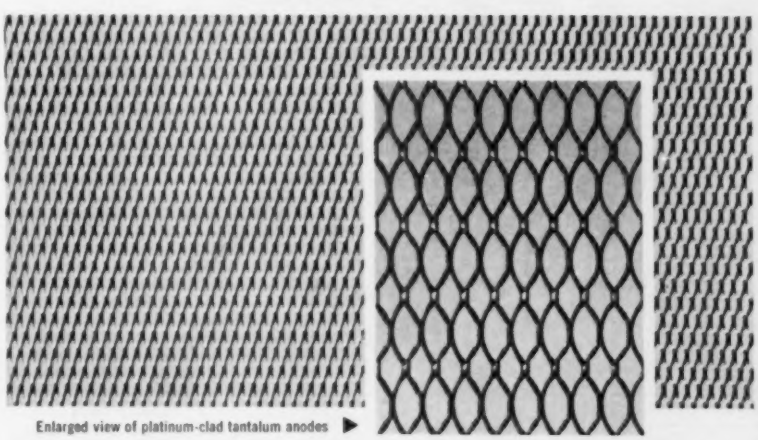

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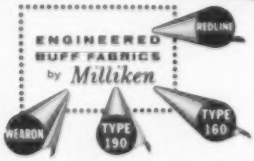

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members of the Branch. **Vincent Mattacotti** was the moderator who monitored the questions from the floor on problems in organic and inorganic finishing of metals. Questions on inorganic problems were directed to panel members **Henry Bornitzke** and **Robert Steuernagel.** Questions on organic finishing problems were directed to **Herman Tessmann** and Harvey McClellan. The success of the program was indicated by the lively member participation and the rapid passing of scheduled time.

S. Taterzynski
President

NEWARK

Ladies Night Features Wine, Women and Song

President **John Banta** called the April meeting to order at 9:00 p.m. The late starting time was due to long dinner hour, the largest group attended the Dutch Treat Dinner.

In view of the late start, and as it was Ladies Night with a long program no regular business was conducted except the processing of two new members.

Al Korbelak introduced Mr. **De Lorenzo,** the Eastern representative of Almaden Vineyards. He showed two very interesting films on "Wine Making" and "The Use of Wines in Cooking." After a short talk on the use of wine, both as a beverage and as a supplement in cooking, he invited us to sample many varieties. This provided a very enjoyable moment to discuss wines as well as to please the palate.

Cy La Manna, the new librarian, presented **Miss Elissa Rinker** who performed a pantomine and dance skit. It was quite enjoyable and the audience gave her a big hand.

Following this, Mr. La Manna called upon Mr. and Mrs. **William Grigat** to conduct the game of Bunco. As the winning couples moved up a table, it gave all of us a chance to meet new people. Prizes went to the winning ladies. Gentlemen were not permitted to win on ladies night. Refreshments were served.

Gustav Bittrich
Reporting Secretary

NEW YORK

President **Joseph Rembecki** called the April 8 meeting to order at the Hotel Statler.

Three applications for membership were received and forwarded to board of managers for further study. Two men were unanimously elected as members and duly sworn in by President Rembecki.

After the second and final nominations for officers was made, the election took place. The newly elected officers are: President, Joseph Rembecki; first vice president, **Jack Weiner;** second vice president, **Arthur Carlson;** librarian, **Martin Pollack;** financial secretary, **Isidore Friedman;** recording secretary, **Fred Saras;** sergeant-at-arms, **Daniel Paris;** board of managers, **Phil Bruno;** secretary-treasurer, **Milton Nadel.**

Saturday, Feb. 4, has been set as the date for next year's annual banquet and technical session.

Motion made and carried that a committee be named to study our Branch bylaws, and after revisions and approval a copy be given to all members of our Branch.

President Rembecki appointed **Sol Ader** as chairman and Isidore Friedman, **Al Fusco, Angelo Amatore** and Milton Nadel to the bylaws committee.

Librarian Martin Pollack introduced **Leo Sovzis,** senior chemist at Wright Aero Division of Curtiss Wright Corp., who spoke on, "Direct Nickel Plating of Hardenable Stainless Steel". Mr. Sovzis described the need for protection on certain parts of jet engines. The protection was accomplished by electroplating nickel on the base metal. Before production plating his firm ran a series of tests to check the effect of plating on the base metal to learn if it increases metal fatigue, effects of hydrogen embrittlement, and corrosion and abrasion resistance of the plates. The best results were obtained by using a sulfamate nickel bath and sulfamic acid as activiator for base metal, making sure current is applied before entering bath.

For a very informative talk, Mr. Sovzis, a member of our Branch, was tendered a rising vote of thanks.

Fred Saras
Recording Secretary

PHILADELPHIA

Plating Specifications Discussed by Haas

The regular meeting was held in the Engineers' Club main dining room on April 25 with about 50 present. Guests introduced by Branch Second Vice President **Hauseman** included **Edward J. Roach,** secretary, Baltimore-Washington Branch.

Librarian **Berenato** introduced the speaker, **Joseph Haas,** Sperry Rand Corp., whose subject was "Problems a Plater Must Face When Plating to Specifications." Mr. Haas said that platers as a group did not have difficulties meeting ASTM or Government plating specifications. The major problems were encountered in meeting tolerances specified by design engineers unacquainted with or refusing to recognize the difference between mechanical and electroplating tolerances. He cited several examples of ridiculous plating specifications with respect to thicknesses requested.

The important factor in meeting thickness specifications is the uniform distribution of the plated coating. Without the aid of special fixtures and shields, it is impossible to deposit uniform thickness over the cathode surface.

Mr. Haas discussed the factors involved in obtaining uniform plating distribution:

1. Current distribution in the plating unit—recommended and explained why anodes should be shorter than cathodes and should be grouped in center of anode bars;
2. Throwing power of plating solution;
3. Area of parts to be plated;
4. The correct current density to be used;
5. Cathode efficiency: recommended not using published data—it must be determined for the particular solution;
6. Thickness to be plated: Mr. Haas gave an example of determining cathode efficiency and its relation to the correct plating time for the desired thickness;
7. Temperature control to within ±2F was important.

Mr. Haas's talk produced many questions and it was stated by Librarian Berenato, in calling for a rising vote of thanks, that it had been a pleasure to listen to a paper which provided plating information that could be put to immediate practical use.

The minutes of the previous meeting were read; Treasurer **Mentzer** gave the financial report and stated all 50th Anniversary Celebration bills had been paid. The secretary read **Edward M. Hoffmann's** letter of March 30 in which he resigned as Branch first vice president due to "personal responsibilities and other commitments." His resignation was accepted at the Executive Group's meeting of April 18. A motion was carried thanking Mr. Hoffmann for a job well done and regretting his resignation.

Six active members were admitted; two applications were received. The nominating committee presented its selection of candidates for the 1960–61 term. Other nominations were received from the floor.

Branch President **Cogan** announced his feeling about holding several meetings next season at other locations and asked that suggestions be given to the officers, along with suggested plant tours and good papers heard at other Branch meetings. He spoke of the excellent four-hour educational session in Cincinnati on April 23.

I. Wm. Marcovitch
Secretary

PHOENIX

Tin Plating Presented by MacIntosh

Twenty-one members and guests enjoyed our first meeting at our new meeting place, The Outpost, 3400 North 60th Street, Tuesday, April 12.

In the absence of President **Bill Griff**, First Vice President **Floyd Huhn** opened the meeting, after one of the best dinners we have had this year.

Secretary **James Weaver** reported on the proposed representation in the Arizona Council of Engineering and Scientific Societies.

Treasurer **John Mullarkey** reported on the successful Symposium held at A. S. U. in March.

Floyd Huhn called for appreciative notice for **Paul Wible,** chairman of the symposium and members of his committee.

John Mullarkey spoke briefly on our future plans for a swim party to be held in June. It was voted to have members, wives and friends only, and not children at this affair. Librarian Wible, introduced our speaker **R. S. MacIntosh** of Tin Research institute who spoke on "Tin and Tin Alloy Plating". Many questions showed the appreciation of the fine presentation.

Two new members were approved.

PITTSBURGH

Brenner Speaks to Joint Meeting with Electrochemical Society

The April 13 meeting was a memorable one. The Electrochemical Society and American Electroplaters' Society met in joint session. After cocktails and a steak dinner the technical meeting was opened by AES Branch President **William Pizoli.** He introduced **Herb Phelps,** chairman of the Electrochemical Society. Mr Phelps acquainted the assembly with the vice chairman and secretary-treasurer of the Electrochemical Society's Executive Board. We then met the National Secretary of the Society, **Dr. I. Campbell.**

Our Branch elected two new members.

Librarian **Fred Stevens** introduced the speaker specially picked for the joint meeting, **Dr. Abner Brenner** of the National Bureau of Standards, Washington, D. C. The topic: "Unusual Plating Problems at the Bureau of Standards." Dr. Brenner presented the following interesting subjects: "Plating with Tungsten, Corrosion Coatings for Uranium, and Hydrogen Embrittlement."

He used both slides and practical demonstrations, along with his most capable ability, to get the point across and hold the attention of the audience. After a discussion period the meeting closed with a standing ovation for the speaker.

PORTLAND

Housekeeping in the Plating Plant Discussed by Benning

The March meeting was held at the Ye Olde Towne Crier restaurant.

The meeting began with cocktails at 6:30 p.m., dinner at 7:30 p.m. and then in turn **Al Benning** of Harshaw Chemical Co. spoke on plating in general with a stress on housekeeping.

Members reported the talk as most worthy and an excellent attendance as is typical of the Portland Branch pertained.

Ed Elkins
Secretary

ROCHESTER

Kohler Talks on Tumbling; Branch Golden Jubilee in 1961

The April 4 meeting was called to order

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On the opposite page, we review some of the end results of this policy of beginning with the cotton seed and the soil in our quest for superior cloths for making buffs.

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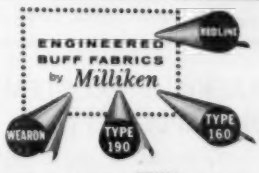

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by President **Anthony Cottrone** at the Rochester German Club.

President Cottrone introduced to the members two distinguished guests, **Harold Harper** of the Austin Fletcher Co. and **Morgan Rake** of International Business Machine Co.

Mr. Rake extended a personal invitation on behalf of the Southern Tier Branch to those present to attend the 6th Empire State Regional Meeting to be held in Elmira April 29 and 30.

John Cipolla reported for the Christmas Party Committee on possible reservations and it was voted to accept as first choice the Redman's Club and as second choice the Midvale Country Club.

The following slate of officers for 1960–61 was presented by Past President **Frank Beuckman,** chairman of the Nominating Committee: President, **Anthony J. Cottrone;** first vice president, John Cipolla; second vice president, **William Elston;** librarian, **Loring F. Carson;** treasurer, **Emil A. Pottridge;** secretary, **Barrie M. Gardner;** board of managers, **Robert Flint, Don Blum, Fred Johnson, Vern Schaeffer, Fred Thiem** and Frank Beuckman; hospitality chairman, **Victor Bonaldi;** benevolent committee, Fred Thiem, **Jack Pandina** and **Sam Guinta.**

Upon a motion of Vic Bonaldi it was decided to present to the president and to all past presidents of the Branch a pin as a token of the Branch's appreciation of their service.

President Cottrone announced the appointment of Vern Schaeffer, chairman, and Victor Bonaldi, co-chairman, of a committee to handle the arrangements of the Rochester Branch's Golden Jubilee to be held in 1961.

Librarian **Frank McNutt** introduced **Arthur Kohler** of the Frederick Gumm Chemical Co., who gave a very interesting and informative talk on "Tumbling". Following Mr. Kohler's talk, refreshments were served through the courtesy of **Charles Clark,** area representative of the Gumm Co.

Barrie M. Gardner
Secretary

SAGINAW VALLEY

Past Presidents Honored; New Officers Installed

The Saginaw Valley Branch held its monthly meeting at Zhender's Hotel in Frankenmuth, Michigan on April 13.

Following an excellent buffet supper the meeting was opened by **D. William Snyder,** president. The first order of business was the transfer of office to the new president for 1960–61, **Raymond Gittens.** Mr. Gittens introduced his staff of officers which will serve the year with him: first vice president, **Frank Reha;** second vice president, **George Gutscher;** secretary-treasurer, **John Krato;** recording secretary, **Patrick Kehoe;** librarian, **James Reed.**

Honored at this meeting were the past presidents of the organization. Following the introduction of each past president, an annual forum was conducted in which the former leaders of the Branch answered questions concerning plating and allied fields. Numbered among the Branch past presidents is **Manuel Ben,** who is currently the third vice president of the national organization.

Following the question and answer portion of the program, a color movie of the 1959 Indianapolis "500" race was shown.

Patrick H. Kehoe, Jr.
Recording Secretary

ST. LOUIS

Macioce Discusses Polution

There were 24 members and guests for dinner at the regular monthly dinner meeting of the St. Louis Branch held at the York Hotel, April 13. The business meeting was called to order by our President **William Piel** with 36 members and guests present. Five new members were accepted, on a motion by **Clarence Meyer** and a second by **William George.**

Andy Julius reported on his attendance of the Interim meeting in Philadelphia and

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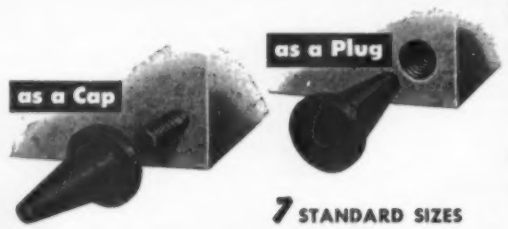

7 STANDARD SIZES

	A	B	C	D	E	F	G
TO PLUG HOLE SIZE	1/8-3/16	3/16-1/4	1/4-5/16	5/16-1/2	1/2-5/8	9/16-11/16	5/8-3/4
TO CAP STUD SIZE	3/32-5/32	5/32-3/16	3/16-1/4	1/4-5/16	5/16-3/8	3/8-7/16	5/16-1/2

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the meeting of the Midwest Regional held in Chicago in January. He reported the Interim Meeting the best attended yet. It was decided there to recommend to the Supreme Society that St. Louis host the exposition as well as the convention in 1964. The Hotel Jefferson would be the headquarters with the Keil Auditorium Exposition Hall handling the exhibits.

Louis J. Berra, reporting for the entertainment committee, said 300 tickets were sold for the May 7 Banquet.

The nominating committee, headed by **Craig McAlister** and with **A. P. Wrisberg** and **Robert Coulson** presented the following slate of officers which were elected unanimously: President, **George Koderhandt;** first vice president, **Homer Thomen;** second vice president, **Peter Young;** secretary, **Ward Kelly;** treasurer, Louis Berra; librarian, **G. Kenneth Robins;** sergeant-at-arms, **Donald Koehler;** board of managers, William Piel, Andy Julius, **L. A. Davies.**

The delegates for period following the 1960 convention through 1961 convention were elected. The delegates to serve for this period are: William Piel, Andy Julius and Robert Coulson.

Gerard Clooney was appointed Research Finance chairman for the Branch.

There being no further business the meeting was turned over to Librarian **Richard Gotsch** who introduced the speaker of the evening **Frank M. Maciocc,** of Industrial Filter & Pump Mfg. Co., Chicago. His subject was "Polution Abatement as Related to the Electroplating Industry." His talk was illustrated by blackboard diagrams and formulae. An active question and answer period indicated the interest of the group.

Ward Kelly
Secretary

SEATTLE-PUGET SOUND

Electroless Nickel Discussed by Local Panel

The April meeting of the Seattle-Puget Sound was held on Thursday April 14, at Andy's Diner 2963 4th Avenue South, Seattle, Washington.

After a confused dinner hour, due to a mix up of names in reserving dining rooms —American Electroplaters' and American Foundrymen Association were apparently assigned the same dining room—the meeting was called to order by President **Joe Rouleau.**

Nominations for the new officers were made and there were other general discussions during a short business meeting.

Electroless Nickel Plating was discussed by a panel of local experts. **Forster Bradford, Tom Gorton, Roger McMonagle,** and **Bill Foley** were some of the men who made the subject very interesting.

Helen Archibald
Secretary

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Interviews may be scheduled during the American Electroplaters' Society meeting in Los Angeles. Please send detailed resume including salary requirements to: Harshaw Chemical Co., 1945 E. 97th St., Cleveland 6, Ohio.

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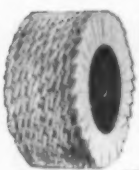

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July 24-28, 1960—47th AES Annual Convention, Hotel Statler, Los Angeles, Calif.

July 24, 1960—Executive Board Meeting, Statler Hotel, Los Angeles, California.

August 6, 1960—Detroit Branch Stag Day, Glen Oaks Country Club, Farmington, Michigan.

September 16, 1960—Second Metropolitan Regional Technical Session, Newark Host Branch, Robert Treat Hotel, Newark, N. J.

September 17, 1960—Boston Branch 24th Annual Educational Meeting and Banquet, Hotel Statler, Boston, Mass.

October 29, 1960—Second Annual Midwest Regional Conference, University of Notre Dame, South Bend, Indiana. St. Joseph Valley Host Branch.

December 2-3, 1960—Detroit Branch Annual Educational Meeting and Banquet, Statler-Hilton Hotel, Detroit, Mich.

December 16-17, 1960—Newark Branch Annual Educational Session and Christmas Banquet, Robert Treat Hotel, Newark, N. J.

January 28, 1961—Chicago Branch Annual Meeting and Banquet, Conrad Hilton Hotel, Chicago, Ill.

February 3-4, 1961—Third Annual Dixie Regional Technical Session, Hotel Roanoke, Roanoke, Virginia. Blue Ridge Host Branch.

February 4, 1961—New York Branch Annual Educational Session and Banquet, Hotel Statler-Hilton, New York, N. Y.

February 4, 1961—Saginaw Valley Branch Annual Educational Session and Banquet, Frankenmuth, Michigan.

February 4, 1961—Seventh Annual Tri-State Regional Meeting, Deshler-Hilton Hotel, Columbus, Ohio.

February 11, 1961—Eighth Interim Meeting, Supreme Society, Statler Hotel, Hartford, Connecticut. New England Regional Council, Host.

May 2, 1961—Central Michigan Branch Annual Educational Session and Banquet, Hotel Hayes, Jackson, Michigan.

June 18-23, 1961—48th AES Annual Convention, Hotel Statler, Boston, Mass.

June 25-28, 1962—49th AES Annual Convention, Schroeder Hotel, Milwaukee, Wis. Sponsorship Midwest Regional Council.

June 24-27, 1963—**50th AES Annual Convention,** Ambassador Hotel, Atlantic City. N. J. Sponsorship Newark Branch.

June 15-18, 1964—**51st AES Annual Convention,** St. Louis, Missouri.

June 28-July 1, 1965—**52nd AES Annual Convention,** Statler Hotel, New York, N. Y.

INTERSOCIETY

June 26-July 1, 1960—**American Society for Testing Materials,** 63rd Annual Meeting (with Apparatus Exhibit), Chalfonte-Haddon Hall, Atlantic City, N. J.

July 22-24, 1960—**National Association of Metal Finishers,** 5th Annual Convention, Hotel Statler, Los Angeles, California.

July 24, 1960—**Metal Finishing Suppliers' Association,** Board of Trustees Meeting, Hotel Statler, Los Angeles, Calif.

July 25, 1960—**Metal Finishing Suppliers' Association,** Annual Luncheon and Meeting, Hotel Statler, Los Angeles, Calif.

September 7-15, 1960—**2nd Coliseum Machinery Show,** Chicago Coliseum, Chicago, Ill.

September 26-30, 1960—**Instrument Society of America,** 15th Annual Meeting; Instrument-Automation Conference and Exhibit, Coliseum, New York, N. Y.

October 9-13, 1960—**The Electrochemical Society,** Fall Meeting, Shamrock Hotel, Houston, Texas.

October 12-14, 1960—**American Vacuum Society,** 7th National Symposium, Cleveland-Sheraton Hotel, Cleveland, Ohio.

October 17-21, 1960—**American Society for Metals,** 42nd National Metal Exposition and Congress, Trade and Convention Center, Philadelphia, Pa.

October 25-28, 1960—**National Corrosion Engineers,** South Central Region Conference, Mayo Hotel, Tulsa, Okla.

November 8-11, 1960—**Society of Die Casting Engineers,** First National Die Casting Exposition and Congress, Detroit Artillery Armory, Detroit, Mich.

Jan. 30-Feb. 3, 1961—**American Society for Testing Materials,** Committee Week, Netherland-Hilton Hotel, Cincinnati, Ohio.

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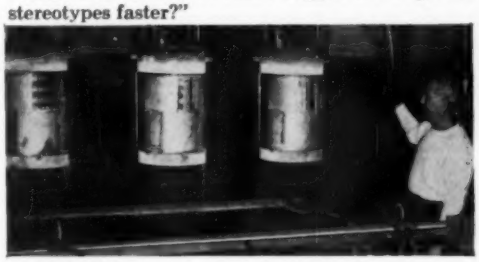

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